# Minerals yearbook: Area reports: international 1974. Year 1974, Volume 3 1974

Bureau of Mines
Washington, D. C.: Bureau of Mines : United States Government Printing Office, 1974

# Minerals Yearbook

# 1974

## *Volume III*

## AREA REPORTS: INTERNATIONAL

*Prepared by staff of the*

BUREAU OF MINES

**UNITED STATES DEPARTMENT OF THE INTERIOR**

**BUREAU OF MINES**

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

**U.S. GOVERNMENT PRINTING OFFICE**

**WASHINGTON : 1977**

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

Stock No. 024-004-01910-7

# Foreword

The Federal Government, through the medium of the Minerals Yearbook or its predecessor volumes, has for 92 years reported annually on mineral industry activities. This edition of the Minerals Yearbook presents the record on worldwide mineral industry performance during 1974. In addition to statistics, the volumes provide background information to help in interpreting the year's developments. The content of the individual volumes is as follows:

Volume I, Metals, Minerals, and Fuels, contains chapters on virtually all metallic, nonmetallic, and mineral fuel commodities important to the domestic economy. In addition, it includes a general review chapter on the mineral industries, a statistical summary, and a chapter on mining and quarrying trends.

Volume II, Area Reports: Domestic, contains chapters on the mineral industry of each of the 50 States, the U.S. island possessions in the Pacific Ocean and the Caribbean Sea, the Commonwealth of Puerto Rico, and the Canal Zone. This volume also has a statistical summary, identical to that in Volume I.

Volume III, Area Reports: International, contains the latest available mineral data on more than 130 foreign countries and discusses the importance of minerals to the economies of these nations. A separate chapter reviews minerals in general and their relationships to the world economy.

The Bureau of Mines continually strives to improve the value of the Yearbook for its users. Therefore, the constructive comments and suggestions of readers will be welcomed.

***Director.***

# Acknowledgments

The Bureau of Mines, in preparing this volume, utilized extensively statistical and other basic data on mineral production, consumption, and trade provided by various foreign government mineral and statistical agencies through a variety of official publications. The cooperation and assistance of these agencies is gratefully acknowledged. Statistical and informational material was also obtained from airgrams of the U.S. Department of State, from United Nations publications, and from the domestic and foreign technical and trade press. Of particular help in preparing this volume were the routine and special reports submitted by the minerals, petroleum, economic, and commercial officers and other members of the Department of State. Their contributions are sincerely appreciated.

The chapters of this volume were prepared by the staff of the Assistant Director—International Data and Analysis of the Associate Directorate—Minerals and Materials Supply/Demand Analysis. The "Minerals in the World Economy" chapter and the production and trade tables of the country chapters were prepared in the Geographic Statistics Group of the Office of Technical Data Services. Final correlation and checking of this volume were performed by the Minerals Yearbook staff of the Office of Technical Data Services.

The regimes of some countries reviewed in this volume are not recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not construed as conflicting with or being contradictory of U.S. policies toward these countries.

ALBERT E. SCHRECK, *Editor-in-Chief.*

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# Minerals in the World Economy

By Charles L. Kimbell [1] and George A. Morgan [2]

The world's mineral industry in 1974 again registered gains in almost all measurable aspects of its activities, showing a rather surprising recovery from the energy crisis of late 1973 and early 1974. By yearend, however, there were definite indications, at least among developed market economy nations, of economic problems, some relating to high fuel costs, and of industrial slowdowns in industries that consume mineral industry products, and these difficulties did not provide a very bright outlook for industrywide growth as 1975 began. A somewhat brighter outlook was indicated for the developing market economy nations as a group, but not for all members of the group individually, as market prices for their raw materials (most notably crude oil) advanced considerably. Obviously those developing market economy countries with substantial production facilities for minerals—particularly fuel minerals—registered substantial economic benefits in terms of earnings per unit of mineral commodity sold, but reductions in volume of output occurred in some places, thus partly negating gains made on the basis of unit price increases. However, developing market economy nations with limited exploitable mineral resources suffered from higher prices for fuels and other imported mineral products as well as from lower levels of activity in other sectors of their economy that in turn were partly related to the higher prevailing fuel costs. These costs, coupled with higher prices for other commodities manufactured using the more expensive energy products, combined to make the goals of a higher quality of living less attainable in the nonenergy-rich developing countries, while the energy-rich developing nations benefitted considerably.

The centrally planned economy nations of Eastern Europe and Asia were generally less affected by the energy crisis and its related problems than were the market economy countries, but there were some effects upon interbloc trade patterns. Here, unlike in the market economy nations, there was no evidence of a mineral industrial activity downturn at yearend.

The United Nations index of overall world industrial production for 1974 was 4.1% higher than that for 1973, reflecting both increases in output and inflationary price trends. The following tabulation compares, on a percentage change basis, the differences in United Nations production indexes for various sectors of the mineral industry between 1972 and 1973 and between 1973 and 1974:

[1] Supervisory physical scientist, Office of Technical Data Services.
[2] Physical scientist, Office of Technical Data Services.

| Industry sector | Percentage change in United Nations world industrial production indexes | |
|---|---|---|
| | 1972–73 | 1973–74 |
| Extractive industries: | | |
| Metals | +5.9 | +1.9 |
| Coal | −1.0 | -- |
| Crude petroleum and natural gas | +8.0 | +5.0 |
| Total extractive | +6.5 | +3.5 |
| Processing industries: | | |
| Base metals | +11.2 | +2.5 |
| Nonmetallic mineral products | +8.8 | +2.4 |
| Chemicals, petroleum, coal products | +11.2 | +3.9 |
| Overall industrial production | +8.9 | +4.1 |

Receipt of additional and revised data by the United Nations on worldwide production activities in 1972 and 1973 (subsequent to the publication of the 1973 edition of this chapter) led to a downward revision in the overall industrial production index growth rate from the 9.6% increase reported in that chapter to the 8.9% increase reported in this edition. In contrast, however, the growth rate for five of the minerals-related sectors was higher in the revised data than in the original.

For all of the mineral producing and mineral processing sectors of the overall world industrial complex listed in the foregoing tabulation, 1974 was a year of reduced growth rate levels from those set in 1973 except for coal mining, where a zero growth level was recorded for 1974 in contrast to the 1% decline registered for 1973. It seems noteworthy that in 1974 only the crude petroleum and natural gas extraction sector among the listed mineral-related industrial sectors registered a growth rate exceeding the overall industrial production index, in contrast to the experience of 1973, when base metals processing and chemicals, petroleum and coal processing, as well as crude petroleum and natural gas extraction registered a greater increase than overall industrial production.

Available partial and preliminary data on world trade suggest that the total value of major mineral commodity trade (SITC–R Divisions 27, 28, 32, 33, 34, 67, and 68) in 1974 was of the order of $160,000 million, up by 5% or more from the recorded level of $152,061 million for 1973. This modest growth, far lower than the 43% increase registered between 1972 and 1973, reflects the modest increases in prices in 1974 (compared with the sharp increase in 1973), as well as a marked slowdown in growth, if not a small decline in the overall volume of materials being moved. Considering crude oil, the largest single mineral commodity moved in terms of volume, world exports totaled 11,478 million barrels in 1974, about 0.8% below the 1973 level of 11,563 million barrels.

World mineral consumption in 1974 was generally at modestly higher levels than in 1973, but this was by no means universal for mineral commodities. Preliminary figures suggest that worldwide energy consumption advanced by only 0.8% over the 1973 level reaching 7,971 million metric tons of standard coal equivalent (7,909 million tons in 1973). This may be contrasted with a 5.8% growth rate between 1972 and 1973. It seems most significant to note that the growth rate differed considerably between market economy countries and centrally planned economy countries, with the former as a group registering a decline of about 0.9%, while the latter registered a 4.8% increase. In the case of the iron and steel industry, world consumption of both iron ore and scrap reached new highs, increasing by 2.8% and 2.2%, respectively, in 1974, both rates of increase below those set between 1972 and 1973 (10.9% and 7.1%, respectively). Among major nonferrous metals, only aluminum registered a gain in quantity from the viewpoint of consumption between 1973 and 1974 (up 2.6%); in contrast copper, lead, zinc, and tin showed declines ranging from 3.7% to 6.3%. This decline in use led to output cutbacks late in 1974 and foretold of reduced output levels in 1975 to avoid development of substantial stocks.

Considering prices of mineral materials, the higher prices for fuels, particularly oil, was undoubtedly the most significant from the viewpoint of impact on the economy, and this fuel cost increase was a major factor in increases in prices of most major nonfuel mineral commodities in 1974.

Wars and civil disorders had a much more modest effect on mineral production in 1974 than in 1973. The virtual end of U.S. involvement in Vietnam reduced requirements for mineral commodity supplies in that area. In Chile, the copper industry recovered from the slump related to the change of government in September 1973. Efforts continued to clear the Suez Canal of the debris of the Yom Kippur war and the reopening of this important transportation route was expected in 1975.

## PRODUCTION

The estimated value of world crude mineral production in 1974 was $198,300 million in terms of constant 1973 dollars, an amount of $6,700 million or 3.5% higher than the 1973 level. The indicated growth between 1973 and 1974 was much less than the 6.6% increase indicated for 1972 to 1973. The following tabulation

gives approximate data on value of world crude mineral production for selected years in the time period 1950–74, both as reported in a recognized international mining magazine for a selected group of commodities and as extrapolated to cover all crude mineral commodities by the U.S. Bureau of Mines:

| Year | Thousand million constant 1973 dollars | |
|---|---|---|
| | Value of 53 [1] major crude mineral commodities [2] | Value of all crude mineral commodities [3] |
| 1950 | 46.2 | 52.6 |
| 1953 | 60.3 | 69.3 |
| 1958 | 77.4 | 93.0 |
| 1963 | 85.6 | 104.9 |
| 1968 | 99.2 | 120.2 |
| 1972 | 149.4 | 179.8 |
| 1973 | 159.2 | 191.6 |
| 1974 | 164.8 | 198.3 |

[1] The list of commodities included appears in table 5 of this chapter; one commodity covered for 1950–68 (beryl) is excluded from the 1972–74 figures, but the overall impact of this omission is regarded as insignificant.

[2] Data for all years except 1972 and 1974 are as reported in Annales des Mines, December 1975, p. 13; data for 1972 and 1974 are extrapolated from the 1973 Annales des Mines figure on the basis of the United Nations index of extractive industry production in United Nations Monthly Bulletin of Statistics, August 1975, p. xii.

[3] Data extrapolated from those values given for 53 commodities to compensate for commodities not included in the source of that data. For details on the basis for extrapolation, see relevant text in this chapter under "Value of World Mineral Production."

It should immediately be stressed that the figures in the foregoing tabulation differ appreciably from those appearing in previous editions of this chapter, in part because the values in previous editions are in terms of 1968 constant dollars, while the values herein are in terms of 1973 constant dollars. Moreover, it should be noted that the figures for 1974 differ significantly from a preliminary estimate made by the source publication for 1974. The reasons for these differences are discussed in more detail under "Value of World Mineral Production" subsequently in this chapter.

These figures, unfortunately, tend to belittle the role of the mineral industry in the world's economy, consisting as they do of only the crude mineral value. If the value added through processing—smelting of metals, refining of oil, and manufacture of materials such as cement—were included, a 1974 figure of the order of $430,000 million could be regarded as a conservative estimate of the value of the output of the world's mines, smelters, and refineries. Moreover, it should be considered that these crude and processed mineral commodities constitute an overwhelmingly dominant part of the material base for all manufacturing endeavors, as well as a significant requirement for the agricultural industries, the latter in that they include the major fertilizer materials.

## PRODUCTION INDEX PATTERNS

The United Nations indexes for mineral industry production of the world (excluding the centrally planned economy nations of Asia) are given in table 1, together with index numbers for major sectors of the industry and for overall industrial production; all figures being provided for both the world aggregate and for individual major geographic and economic areas.

The index for output of the extractive industry as a whole again increased in 1974, exceeding the 1973 level by 3.5%; however, this increase was much smaller than the 6.5% growth recorded between 1972 and 1973. Moreover, when this growth is considered in the light of increased constant dollar values for many commodities, it is evident that gains in quantity of material produced were minimal.

Considering individual sectors of the extractive industry, the crude petroleum and natural gas index showed the most substantial gain, between 1973 and 1974, a 5% increase compared with an 8% increase between 1972 and 1973. The metal mining index rose by 1.9% between 1973 and 1974, compared with a 5.9% increase between 1972 and 1973, and the index for coal remained unchanged between 1973 and 1974, having shown a 1% decline between 1972 and 1973.

Reviewing the minerals processing sectors for which index numbers are available, the world's base metals processing sector registered only a 2.5% gain between 1973 and 1974 compared with an 11.2% growth between 1972 and 1973. Similarly the world's nonmetallic mineral products sector index advanced only 2.4% between 1973 and 1974 (8.8% between 1972 and 1973), and the world's chemicals, petroleum products, and coal products sector index increased only 3.9% between 1973 and 1974 (11.2% between 1972 and 1974). Perhaps even more noteworthy was the fact that all three of these sectors as well as two of the three listed sectors of the extractive industry (coal being the lone exception) showed declines after mid-year 1974.

Considering the differences between geographic areas in most general terms, the centrally planned economy nations showed greater advances between 1973 and 1974 than did the market economy countries, but within the broad group of market economy countries, some areas matched or exceeded the increases registered by the centrally planned economy countries.

## QUANTITATIVE COMMODITY OUTPUT

Total world output of 71 mineral commodities for the years 1972–74 is given in table 2. Regional distribution of output of these same commodities is given on a percentage basis in table 3. In addition to these same commodities is given on a per- the end of this chapter includes world output of selected major commodities by principal producing countries for 1972–74.

**Nonfuel Mineral Commodities.**—Of the 39 metallic mineral commodities listed in table 2, 24 registered production increases in 1974 relative to their 1973 performance, while 14 showed declines and one was not comparable owing to the exclusion of the output of the United States in the 1974 total but not in the 1973 total.

Among the 23 industrial nonmetallic mineral commodities for which production data are given in table 2, 20 recorded higher output levels in 1974 than in 1973, with only 3 showing declines.

Tables 33 to 48 inclusive in the statistical summary section of this chapter give output levels of selected major nonfuel mineral commodities (metals and nonmetals) by major producers for 1972–74.

**Mineral Fuel Commodities.**—In 1974, world production of energy from all sources reached a level of 8,641 million tons of standard coal equivalent (SCE) compared with 8,538 million tons SCE in 1973 and 8,037 million tons SCE in 1972 (both figures revised from those reported in previous editions of this chapter). The 1974 figure was a new high for total world energy production, and the growth was a general one, shared by each of the major primary commercial energy sources,[3] although the growth rate was not uniform for each of the energy sources. The percentage distribution of each major energy source for the years 1972–74 inclusive is given in the following tabulation:

| Energy source | Share of total energy production (percent) [1] | | |
|---|---|---|---|
| | 1972 | 1973 | 1974 |
| Coal (including lignite) | 30.4 | 29.1 | 29.1 |
| Petroleum | 48.0 | 49.5 | 49.1 |
| Natural gas | 19.4 | 19.2 | 19.4 |
| Hydro, geothermal, nuclear electricity | 2.2 | 2.2 | 2.4 |
| Total | 100.0 | 100.0 | 100.0 |

[1] Based on data in United Nations, World Energy Supplies, 1950–74. Statistical Papers, Ser. J, No. 19, New York, 1976, p. 10.

For the first time since 1958, petroleum registered a decline in its share of total energy supply in 1974, while coal (all types) remained virtually even with its 1973 share, with natural gas and primary electric power registering increases in their share of the total.

Output data by major producing countries for coal, natural gas, and crude petroleum for the 3-year period 1972–74

[3] Petroleum, coal (anthracite, bituminous, and lignite), natural gas, and hydroelectric and nuclear electric power; data do not include figures for fuelwood, charcoal, bagasse, animal dung, rice husks, peat, and other minor fuels, although such materials are used as commercial fuels in some nations and in a few countries are the source of a significant part of total energy produced.

are given in tables 49, 50, and 51, respectively.

## VALUE OF WORLD MINERAL PRODUCTION

The comprehensive study on value of world mineral production that has been prepared for over two decades for the French language monthly mineral industry publication, *Annales des Mines* was extended for another 5-year increment in the December 1975 issue of that publication. The series now provides nearly uniform data for the years 1950, 1953, 1958, 1963, 1968, and 1973. The study fixes the constant 1973 dollar value of total world production of a selected list of crude mineral commodities [4] at $159,201.4 million for 1973, compared with a 1973 constant dollar value of $99,230.4 million for 1968. This 60% increase in value between 1968 and 1973 is equivalent to an average annual increase of 9.9%, which the source publication attributes to a 5.6% annual average increase in quantity and a 4.1% annual average increase in the inflation-corrected price index for crude minerals. The figures in the French source have been roughly extrapolated by the U.S. Bureau of Mines to cover the full range of crude mineral commodities covered in the Minerals Yearbook, on the basis of the share of total U.S. crude mineral output value accounted for by those selected commodities covered by the French source. Basic data for this extrapolation are as follows:

| Year | Million current U.S. dollars | | Percentage of total accounted for by selected commodities |
|---|---|---|---|
| | Value of total U.S. crude mineral output | Value of U.S. output of selected minerals covered in Annales des Mines [1] | |
| 1950 | 11,855 | 10,405 | 87.8 |
| 1953 | 14,382 | 12,511 | 87.0 |
| 1958 | 16,526 | 13,754 | 83.2 |
| 1963 | 19,620 | 16,002 | 81.6 |
| 1968 | 24,974 | 20,591 | 82.5 |
| 1973 | 36,788 | 30,579 | 83.1 |

[1] Values as reported by U.S. Bureau of Mines, not as reported in *Annales des Mines*. Corresponding values as reported in *Annales des Mines* in million dollars were: 1950—$10,406; 1953—$12,435; 1958—$12,440; 1963—$15,742; 1968—$20,232; and 1973—$29,876.

The published figures for value of world production appearing in *Annales des Mines* for the selected group of commodities were increased on the basis of the percentages in the right hand column of the foregoing tabulation because comprehensive international data are not available on production of many of the commodities not covered in the French source, either on the basis of tonnage or value. The extrapolation has been done on the basis of the U.S. experience in order to provide at least a rough approximation of the value of total world crude mineral output, even though it is recognized that, in all likelihood, the ratio between (1) the value of commodities included in the French study and (2) the value of commodities excluded from that study is not at all consistent from country to country around the world. The results of this extrapolation appear in the first tabulation under the heading "production" in a preceding part of this chapter. That tabulation also includes an extrapolation of the *Annales des Mines* 1973 figure to 1974, based on the United Nations index of world extractive industry production, and an interpolation of a figure for 1972 based on the same index. It should be noted that the extrapolation for 1974 differs widely from an estimate of 1974 world crude mineral production value provided in the *Annales des Mines* article.

This French publication gives the estimated value of output of selected crude minerals in 1974 at $315,000 million to $320,000 million, nearly a doubling in the value calculated for 1973, with only 1% of the increase as a result of an increase in quantity, the rest being attributed to a virtual 100% increase in the constant dollar-based crude mineral price index. This does not adequately take into account inflation. Considering data for the United States alone, the current dollar value of

[4] For commodities included, see table 5 of this chapter.

total crude mineral output advanced nearly 50% from $36,788 million in 1973 to $55,172 million in 1974, but application of a deflator factor to the 1974 value to express it in terms of 1973 constant dollars gives a figure of $35,989 million, about 2.2% below the 1973 level. Considering the lower activity level of industry in many developed industrialized nations in 1974, the extrapolation on the basis of the United Nations index appears more representative of actual events than does the *Annales des Mines* estimate.

## GEOGRAPHIC DISTRIBUTION OF WORLD MINERAL OUTPUT VALUE

Available information is inadequate to extrapolate to 1974 the value of crude mineral commodity production on a country by country basis from the 1973 data published in *Annales des Mines,* but it seems in order to present that 1973 data as a reasonably reliable picture of the roles played by various nations in the worldwide mineral extraction picture. In 1973, the United States continued to rank first among the countries, accounting for 18.77% of the total value of output of the commodities selected for inclusion in the *Annales des Mines* study. The United States was followed very closely by the U.S.S.R., with 17.64% of the 1973 total, as shown in table 4. The relative ranking of these nations has not changed since the study was started in 1950, but the share of the total accounted for by each country has varied sharply, with the United States registering a continual decline from nearly 40% of the total in 1950, while the U.S.S.R. showed a gain from slightly better than 11.4% of the total in 1950 to over 18.1% in 1968, with a decline of 17.6% in 1973.

Saudi Arabia ranked third in 1973, with about 5.7% of the total (including that nation's share of output from the Kuwait-Saudi Arabia Partitioned Zone), this advance from eighth rank in 1968 was almost wholly due to the country's role as an oil producer.

The People's Republic of China, ranked fourth in both 1968 and 1973, showed a modest increase in its share of the total, while Iran, ranked fifth in 1973, more than doubled its output value between 1968 and 1973, and in doing so advanced from 11th rank in 1968. Canada, which ranked third in 1968; Venezuela, which ranked fifth in 1968; West Germany, which ranked sixth in 1968; and Libya, which ranked ninth in 1968, occupied, respectively, sixth, seventh, eighth, and ninth places in 1973, followed by the Republic of South Africa, which ranked 10th in both years. Among the top 10 producing nations in 1968, only the United Kingdom fell from that group, dropping from seventh rank in 1968 to 13th rank in 1973. Space does not permit further or more detailed review of individual countries and their shifts in shares from 1968 to 1973, but it appears significant to point out that the share of the total accounted for by the top 10 nations in each of the years has declined. In 1950, the first 10 ranked nations accounted for 77.65% of the total, compared with 70.32% in 1968 and 67.5% in 1973, reflecting chiefly the relatively higher growth rates of developing nations as sources of world mineral supplies. Among developed market economy nations, only Australia (on the basis chiefly of its gains in bauxite, iron ore, and copper) and the Netherlands (almost solely on the development of the Groningen gasfield) showed substantial increases in rank or share of total, while a number of developing market economy nations advanced appreciably, among the more noticeable being Nigeria, Indonesia, and Abu Dhabi (of the United Arab Emirates).

## COMMODITY DISTRIBUTION OF WORLD MINERAL OUTPUT VALUE

As in the case of a geographic distribution of the *Annales des Mines* data on value of crude mineral output, the inadequacy of data precludes extrapolating from 1973 to 1974 any distribution by commodity. Table 5 of this chapter, however, furnishes the 1973 figures for each of the commodities covered in the French study. The most salient points to note include the continued rise in the relative importance of petroleum which ranked first among all commodities in terms of value, from 33.8% of the total in 1950 to 40.0% in 1968 and to 47.5% in 1973. Also noteworthy is the decline in the role of second-ranked bituminous and anthracite coal from 37.8% in 1950 to 21.0% in 1968 and to 18.2% in 1973, this latter decline despite an increase in each year in terms of constant dollar value. Following the pattern of petroleum between 1968 and 1973, natural gas, ranked third among all com-

modities in both these years, accounted for an increased share of the total in 1973, with a figure of 7%. Another significant point was the change in the percentage share credited to all fuel-related materials (petroleum, anthracite coal, bituminous coal, lignite coal, natural gas, and natural gas liquids), which as a group accounted for 76.5% of the total in 1950, declined to 72.9% in 1968, and then increased to a new high of 77.0% in 1973.

Among the nonfuel minerals, copper ranked first in terms of crude output value in 1973 as in 1968, and the commodity was ranked fourth among all listed commodities in both those years, but it accounted for only 6.31% of the value of the listed commodities in 1973. Iron ranked second among the nonfuel minerals and fifth among all listed commodities in both 1968 and 1973, accounting for only 4.43% of the total value in 1973. Other metals, specifically gold, zinc, nickel, and lead, occupied sixth, ninth, tenth, and eleventh places, respectively, among the total list of commodities in 1973, with lignite coal and natural gas liquids (ranked seventh and eighth, respectively) completing the list of the top 11 commodities. The highest ranked industrial nonmetal was salt, in 12th place in 1973, followed directly by potash and diamond, but none of the commodities ranking below 8th individually accounted for 1% of the total of the listed commodities. The first eight commodities in 1973—five fuels and three metals—accounted for 89.98% of the total value of the 51 commodities listed in that year.

Percentage shares of total listed values accounted for by major commodity groups are shown in the following tabulation (uranium counted among fuels):

| Commodity group | Percent of value of all listed commodities | | |
|---|---|---|---|
| | 1950 | 1968 | 1973 |
| Mineral fuels | 76.5 | 72.9 | 77.0 |
| Metals | 19.2 | 21.0 | 18.7 |
| Industrial nonmetallics | 4.3 | 6.1 | 4.3 |

In considering the foregoing tabulation, however, it should be borne in mind that the list of commodities represented is incomplete, excluding a number of major nonmetallics, most prominent of which are stone and sand and gravel and, if data for these materials were available, the industrial nonmetals would account for a considerably larger part of the total.

## TRADE

### GENERAL TRENDS

Data on a worldwide basis concerning the aggregate value of world mineral trade is not yet available for 1974. If the results of previous years are any indication of what can be expected, however, it may be assumed that an increase of from 10% to 20% was not unreasonable. But when one examines the results for 1973, the most recent year for which such data are available, one finds that the estimated value of all mineral commodities traded was $152,061 million, a startling increase of 42.8% from the previous year's 16.3% increase. Such unparalleled change was the result of the world energy situation brought on in part by restricted fuel supplies and higher prices—a situation whose ripple effect spilled over into other commodities and continued into 1974 as indicated by the pricing situations mentioned elsewhere in this chapter. In terms of actual dollar value, the total represents an increase of $45,607 million from the previous year and accounts for 26.6% of the value of all commodities traded compared with 25.6% in 1972. A comparison of 5-year data (1969–73) of the estimated value of world trade is shown in the following tabulation:

| Year | Estimated value of all mineral commodities traded [1] (million dollars) | Increase relative to previous year (percent) | Mineral commodities' share of all commodities traded (percent) |
|---|---|---|---|
| 1969 | 71,166 | 12.3 | 26.2 |
| 1970 | 83,497 | 17.3 | 26.8 |
| 1971 | 91,571 | 9.7 | 26.2 |
| 1972 | 106,454 | 16.3 | 25.6 |
| 1973 | 152,061 | 42.8 | 26.6 |

[1] Value estimated from data on mineral commodities appearing in table 6 to which have been added a factor for all mineral commodities not included in that table. The factor added is based on comparison of complete mineral trade value returns for selected countries with data given for these same countries in the source for table 6, which includes only the selected mineral commodity groups specified in the footnotes to that table. This comparison indicates that the recorded mineral commodities listed in table 6 represent about 81.5% of total mineral commodity trade.

The value of exports from developing market economy countries increased in both absolute terms and in terms of percent of the world total. Trade from developed market economy countries also increased but accounted for a reduced share of the total. The export value of major mineral commodity groups was up dramatically, and while the percentage distribution of the various groups to the total remained relatively unchanged, the growth rates for each were much greater than that recorded for any previous year.

## COMMODITY GROUP TRADE PATTERNS

The pattern in the value of world export trade in five major mineral commodity groups for the years 1969–73, in comparison with the value of all commodities traded, is listed in table 6. This table is then further analyzed in terms of the distribution of total value of export trade in major mineral commodity groups by each group (table 7) and by the percent growth in the value of each group over the same 5-year period (table 8). Consistent with its historical record was the performance of the mineral fuels group, the world export value of which increased to $63,100 million, or 50.9% of the value of all mineral commodities traded. Although this differs only slightly from its revised percentage share in 1972, in terms of growth of value it represents a jump of 43.2% from 1972. Iron and steel had the second highest value of any mineral commodity traded at 23% of the total, well below half of the value listed for mineral fuels, but with a 42% increase over the previous year. This also represents the third consecutive year of decline of iron and steel's percentage of the total. The world export value of nonferrous metals gained a slightly larger percentage of the total, as did all ores, concentrates, and scrap. For both commodity groups the increases reverse a decline which began in 1970. The percentage growth in the value of nonferrous metals was 44.8% in 1973 over that of 1972, but up almost 63% from its low in 1971. The value of ores, concentrates, and scrap, which also experienced a low for the 5-year period in 1971, rebounded 57.6% from that year and 45.2% from 1972. The 1973 value of $11,220 million represents the highest percentage increase of any of the five groups listed. Crude nonmetals accounted for the lowest export value of the major mineral commodity groups; they also experienced the lowest growth rate at 30.4%. The combined value of all metals traded was up 43.4%, while major mineral commodity groups as a whole were up 42.8% over 1972. Comparison with the growth in value of all commodity groups traded at 37.9% indicates that major mineral commodity groups again took the lead which they had attained in 1970. It may be assumed, however, that this reversal will only be a temporary one as the increase in export value of major mineral commodities is passed along to other industries.

## REGIONAL TRADE PATTERNS

An overall picture of the value of world trade in major mineral commodity groups (metal ores, concentrates and scrap, iron and steel, nonferrous metals, nonmetallics, and mineral fuels) is available for 1973. The compilation listed in table 9 gives

value of both imports and exports of the aggregate of major mineral commodity groups for selected areas and countries, as well as trade in all commodities for these same regions. The percent share of total trade by these commodity groups for the regions listed is also given. Table 10 further defines the column titled major mineral commodity groups by listing trade in each group separately in terms of exports from and exports to the regions listed. Finally, table 11, the last of the series, records the direction which the aggregate value of trade in major mineral commodities took in terms of either area of the world, country trade group, or country.

The pattern of world trade in major mineral commodity groups by developed and developing market economy countries and centrally planned economies in terms of aggregate value and percent of the total is given in the following tabulation:

| Destination [1] | Source of exports [1] | | | | |
|---|---|---|---|---|---|
| | Market economy countries | | Centrally planned economies | Undistributed [2] | Total |
| | Developed | Developing | | | |
| Value (million dollars): | | | | | |
| To market economy countries: | | | | | |
| Developed | 46,140 | 43,030 | 5,140 | —100 | 94,210 |
| Developing | 7,765 | 8,830 | 784 | —4 | 17,375 |
| To centrally planned economy countries | 3,561 | 864 | 6,335 | —5 | 10,755 |
| Undistributed [2] | 1,004 | 536 | 41 | 9 | 1,590 |
| Total | 58,470 | 53,260 | 12,300 | —100 | 123,930 |
| Share of world total in percent: | | | | | |
| To market economy countries: | | | | | |
| Developed | 37.2 | 34.7 | 4.1 | ([3]) | 76.0 |
| Developing | 6.3 | 7.1 | .6 | ([3]) | 14.0 |
| To centrally planned economy countries | 2.9 | .7 | 5.1 | ([3]) | 8.7 |
| Undistributed [2] | .8 | .5 | ([3]) | ([3]) | 1.3 |
| Total | 47.2 | 43.0 | 9.8 | ([3]) | 100.0 |

[1] Sources and destinations grouped according to United Nations practice; developed market economy countries are Austria, Belgium, Canada, Denmark, Finland, West Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, the Republic of South Africa, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States, and Yugoslavia; centrally planned economy countries are Albania, Bulgaria, People's Republic of China, Czechoslovakia, East Germany, Hungary, North Korea, Mongolia, Poland, Romania, the U.S.S.R., and North Vietnam; developing market economy countries include all countries not specifically listed previously in this footnote.

[2] Figures represent difference between reported totals and reported detail. Explanations for negative quantities are not provided in source publication.

[3] Insignificant.

As regards actual dollar value, every area listed in the tabulation posted an increase in 1973 over the previous year's level. Developing market economy countries showed a 58.1% increase in the value of their exports to developed market economies, increasing their share of the total to 34.7%, up from 32.6% in 1972. The value of trade among developing market economy countries themselves was up 53.2%, but this amounted to only 7.1% of total world trade in these commodities. The value of trade among developed nations was up 40.1%, but their share of the world total declined several percentage points from 39.5% in 1972 to 37.2% in 1973. Significantly, developed nations also raised the level of trade with developing market economy countries, increasing in value by 58.8% and accounting for 6.3% of the world total. The value of trade from centrally planned economy countries to developed market economies reached $5,140 million, up 64.7%, but still less than 5% of the total. Overall, the value of exports from developed market economy countries continued to make up the largest portion of the world total at 47.2%, but their share declined with respect to developing nations and centrally planned economy countries which accounted for 43% and 9.8%, respectively. Developed market economy countries again raised the percentage of total imports from the world at 76%, up from 75.9% in 1972, thus appearing to sustain the trend of higher consumption levels for those nations. A significant change in the implied consump-

tion pattern was the percent change in receipts by centrally planned economies from the world, which jumped from 9.4% to 14% in 1973, placing them on parity with receipts from developing market economy countries that were also at 14%.

The percentage of value of world trade in all commodities, which was accounted for by major mineral commodities again showed considerable variation for the countries and regions listed in table 9 for 1973. As in the past, the Near East with its petroleum supplies recorded the largest portion, with 85.7% of the value of exports from that region being made up of mineral commodities, unchanged from the previous year. For Other Africa, 58.3% of the value of all exports from that region were mineral commodities, up slightly from 1972. The proportion of trade both into and out of the European Economic Community (EEC), the European Free Trade Association (EFTA), and the centrally planned economy countries of Europe that was mineral commodity changed only slightly compared with that of 1972, but in the case of Other Europe, 17% of the value of that region's exports were in major mineral commodities, up from 11.8% the previous year. The United States and the Republic of South Africa again had the lowest percentage of the total value of exports as mineral commodities, 7.8% and 7.9%, respectively. Although the United States percentage is down from the past year, the value of major mineral commodity groups as a whole increased 41.2%, but this increase, despite its magnitude, was overshadowed by the much larger value of all commodities exported with a 43.4% increase. It must be taken into account that the data presented for the Republic of South Africa exclude values for gold, diamonds, and metals; if these values were added they would considerably change the percentage of mineral commodity exports. Major mineral commodities share of all commodities exported to the regions shown was up for all areas except EFTA, the Near East, and areas listed as not reported. Japan continued in its position as the nation with the largest percentage of total imports listed as mineral commodities at 38.2%, up slightly from 1972. The major mineral commodities share of all commodities exported to the United States amounted to 25.5%, compared with 21.4% the previous year. A similar pattern was experienced by centrally planned economy countries, with 25.4% of the value of exports to those nations listed as mineral oriented. The share of the value of all commodities exported to the Republic of South Africa accounted for by mineral commodities increased to 13.3%, with a twofold increase in the actual value of those commodities.

Each of the individual major mineral commodity groups listed in table 10 showed an increase in the value of exports compared with 1972 values. The largest percentage increase was in mineral fuels, which was up 53.1%, followed by nonferrous metals, up 46.7%, and metal ores, concentrates, and scrap, up 46.2%. Countries and regions which are major fuel exporters generally had the largest increases in value, as in the case of Latin America which went from $4,650 million in 1972 to $7,980 million in 1973, a 72% increase. The value of exports to major industrialized countries or regions of mineral fuels jumped drastically from the previous year. In the case of the United States, the value of mineral fuel imports was up $5,290 million, or 98.5% over that of 1972. The total value of fuel imports for market economy Europe was up 42.1%, but most of this was due to the increase in the EEC where a value increase of 78.5% occurred. The value of mineral fuels to Japan, a net importer of energy, was up 75.3%, while iron and steel exports from that same country were up 47.1%.

Table 11, which lists sources and destinations of the aggregate of major mineral commodities in terms of major world areas and countries, gives an indication of the relative export-import position for those same areas. Thus, comparison of total exports credited to each country or region (vertical grand total column) with total receipts (horizontal grand total line) will indicate the status of the region as either a net importer or net exporter of major mineral commodities. An obvious example of a net exporter is the Near East, where the total value of mineral exports from that region amounted to $23,150 million, compared with imports from the world of $2,267 million. In contrast, the United States with total mineral imports valued at $17,820 million vastly exceeded its export receipts of $5,500 million. Centrally planned economy countries of Europe are net exporters, with the value of mineral commodities exported at $11,780 million in contrast with $9,325 million imported.

## CONSUMPTION

### NONFUEL MINERAL COMMODITIES

Data on consumption of many mineral commodities is lacking for 1974, but based upon what is available, it is reasonable to assume that consumption of many nonfuel mineral commodities again increased, albeit slightly. In particular, the large volume—nonfuel mineral commodities such as iron ore, iron and steel scrap, and fertilizers—showed increases over 1973 levels, but these increases were considerably smaller than in previous years. In the case of iron ore, consumption of 23 major world producers of pig iron, excluding the People's Republic of China (PRC), as given in table 12, increased to 717.7 million tons, or 3% over that of 1973. The portion of this total that was consumed directly in steelmaking was estimated at about 6 million tons. Of the remaining iron ore consumed, about 46% was treated in agglomerating plants prior to being fed to blast furnaces, and an estimated 53% was fed to blast furnaces and other facilities for production of pig iron and other products with or without agglomeration. Individual country consumption levels were up only slightly for some countries. In the United States iron ore consumption was up only 1%, while in Japan it was up 2%, compared with a 22% or 21.7-million-ton increase between 1972 and 1973. The EEC as a whole fared better with iron ore consumption up 6.8%, led mainly by France up 9.5% at 50.8 million tons and Italy up 62.6% at 18.7 million tons. West German consumption was up 4.7 million tons but the United Kingdom, the third largest consumer in the EEC, dropped 22.1% or 6.3 million tons in 1974. The EFTA also registered a decline of 23.8%, but centrally planned economy countries of Europe, which were less affected by the world recession, increased total iron consumption by 4.6% or 9.8 million tons. Most of this increase was in the U.S.S.R., where an additional 6.2 million tons was used in 1974 compared with 1973 consumption.

As in the case of iron ore, consumption of iron and steel scrap increased only modestly, up 2.2% at 306.2 million tons. Table 13 lists consumption of iron and steel scrap by 24 selected countries subdivided into major economic groups for the period 1972–74. As in the past, the United States was the leading consumer of scrap at 95.7 million tons, up 2% over 1973 consumption and 27.8% above total EEC consumption. Japan, previously the second largest consumer of iron and steel scrap, fell to third place behind the U.S.S.R. Japanese consumption fell 4.9% to 46.2 million tons, compared with an increase of 1.3% for the U.S.S.R. at 46.9 million tons. Centrally planned economy countries of Europe as a group increased iron and steel scrap consumption by 3.4% to 68.4 million tons. Notable was the use of recyclable material in the Czechoslovakian steel industry, where consumption increased 23.7% to 6.9 million tons. Consumption by the EEC was up 6.1%, with a considerable portion of the increase due the United Kingdom. That country's use of iron and steel scrap increased 17.1% or 2.5 million tons.

Table 14 lists the estimated world consumption of five major nonferrous metals. Unlike the previous year's performance of these commodities when consumption increased for each metal, there was only an increase for aluminum in 1974. Aluminum consumption was up 2.6% or 340,000 tons, a relatively modest increase compared with the 10.6% increase in 1973 over that of 1972. Copper consumption, heavily tied to the construction industry, decreased 6.3% or 546,000 tons. Lead and zinc consumption declined 3.7% and 5.5%, respectively, in 1974. In the case of the latter, the percentage decline represented a drop of 309,000 tons. Tin, the smallest volume metal consumed, declined 5.7% or 12,000 long tons.

Information concerning the consumption level of many nonmetallic mineral commodities is lacking, but considering the restrictions on fuel supplies and the near tripling of prices for crude oil which had the effect of driving up prices on most mineral commodities, available data indicate that demand slackened considerably and thus drastically reduced consumption. Just as the forces and interactions which make up the economic systems of various countries are diverse in both nature and scope, so are the supply-demand cycles which affect an individual mineral commodity's position. Despite the increased recovery of byproduct sulfur in response to industry fulfillment of pollution emis-

sion level requirements, world consumption of that commodity increased again by 4.2% or 1.3 million tons in 1974. Continued increase in the need for sulfur is attributable to the increase in consumption of fertilizers for the agricultural sector and the consistent demand for sulfuric acid. World consumption of nitrogen fertilizer for the 1973–74 fertilizer year (July 1, 1973 to June 30, 1974) was reported at 38.5 million tons, a 6.7% increase from the previous year. Consumption of phosphate fertilizers ($P_2O_5$ content) increased from 24.2 million tons to 25.7 million tons, a 6.2% increase. Potash consumption in terms of $K_2O$ equivalent for the 1973–74 fertilizer year was 20.9 million tons, a 10.6% increase over the previous year's total.[5]

## MINERAL FUEL COMMODITIES

Table 15 gives world consumption of energy by energy source in terms of standard coal equivalent (SCE) for 1974. Analysis of the change in the actual quantity of energy consumed is available for the period prior to and during the world energy crisis. World consumption of coal, oil, natural gas, and primary electric power (that power produced by means other than the burning of the aforementioned fossil fuels), amounted to 7,971 million metric tons SCE. This represents an increase of only 0.8% from the 7,909 million tons SCE consumed in 1973, when total energy consumption rose 5.8%. In past years the growth rate in per capita consumption lagged behind that for the aggregate of energy consumed, suggesting that world population was increasing at a faster rate than the rate at which additional energy was being produced. But in 1974 per capita energy consumption actually showed a decline, adding credence to the theory that the balance between the two sides is precarious at best and that the total amount of energy available, which is translatable in terms of standard of living, is a critical factor. The percentage share of the total made up by liquid fuels decreased to 44.8% from 45.5% in 1973, a significant decline as that energy source represents the largest portion of the total.

The share of solid fuels continues to increase slightly, up to 31.8% from 31.7% the previous year. The portion accounted for by natural and imported gas also increased slightly, while primary energy made up 2.6% of the total.

The ranking of the various energy sources by rate of growth varied considerably from that of 1973. Liquid fuels declined 1% compared with a 7.8% increase between 1972 and 1973. Natural gas consumption at 20.9% of total energy consumed had a growth rate of 2.8% in 1974 compared with 4.4% in 1973. The growth rate of solid fuels again increased as the availability of liquid fuels declined in 1974, increasing 1.1% in comparison with 4% in 1973.

In addition to breaking down consumption of energy by source, table 15 also gives consumption by continental division for the 6-year period 1969–74. Market economy countries accounted for 69.6% of total world energy consumption at 5,547 million tons SCE. Comparison of the percent distribution by energy source of total energy consumed by market economy countries and centrally planned economy countries continues to reveal marked variation. In the case of market economies, 52.3% of total energy consumption was liquid fuels as opposed to 27.4% for centrally planned economies. Coal continues to be the traditional source of energy for the latter economies, having surpassed the rest of the world in consumption of that fuel in 1971.

The growth rate of solid fuels was approximately 1% for centrally planned economy nations in 1974, while that for market economy nations was unchanged, compared with a 1973 increase of 5.1%. In addition, solid fuels account for 54% of total consumption by centrally planned economies compared with 22% for market economies. Western Europe, in particular, decreased consumption of the solid fuel sector by 4.3% but continued to expand utilization of North Sea resources as natural gas consumption was up 14.8%. Regionally, areas with historically low consumption levels generally have had the highest growth rates of the aggregate of energy consumption. However, in 1974 developing countries suffered severely as they were least prepared to finance the higher costs of increased energy imports. The Far East and Oceania had increases

[5] British Sulphur Corp. Ltd. Statistical Supplement No. 12. November–December 1975, London, 1975.

of only 0.3% and 1.1%, respectively. Only in the Near East, which is a net exporter of liquid fuels, was the growth rate in energy consumption on par with previous years at 8.2%.

World per capita energy consumption decreased by 1%, but on a regional basis this percentage varied considerably. North America with a per capita consumption of 11,321 kilograms, far exceeded consumption by the centrally planned economies of Europe, the next highest ranking area, at 5,139 kilograms. Despite such a position for North America, however, preliminary data indicated that per capita consumption declined for the first time, down 3.1%. Centrally planned economy countries of Europe remained relatively unaffected by the energy crisis, increasing 3.1%; Western Europe, a region of high energy input, experienced a decrease in per capita consumption of 2.1%.

## INVESTMENT

General information regarding worldwide investment in the mineral industry indicated renewed expansion in 1974, particularly as regards petroleum. Although investment data is not available for each commodity for 1974, revised figures available for the petroleum and iron and steel industries, as well as detailed worldwide investment by the United States, indicate a decline in 1973 followed by expansion of investment in 1974. As in the past, comprehensive mineral industry investment data by the centrally planned economy countries is not published, but individual announcements by the U.S.S.R., PRC and various East European countries continue to reveal major expansion plans for plant, refinery, or pipeline development, as well as trade or cooperative agreements. Taken as whole these developments support the general trend of continued expansion or upgrading of mineral industry related facilities in those countries.

Investment expenditures made in the steel industry for 1972 and 1973 for various countries and regions is given in table 16. The data listed indicate that total value of investment declined approximately 2% from the revised 1972 figure of $7,908 million to $7,762 million in 1973. Investment in the nations of the EEC fell 5.2% as the recession which had earlier gripped Japan caught up with Europe. The EFTA expanded investment by $32 million, a relatively insignificant amount in comparison with the EEC. The United States, contrary to an investment decline in most leading industrialized countries and after suffering a 5-year investment decline of its own, increased investment in the steel industry by $432 million. Included in this figure, however, are large expenditures for nonproductive facilities such as pollution monitoring and control devices and equipment. Investment expenditures for the steel industry in Japan declined for the third year as that country began to show major readjustments in its productivity rates for steel and nonferrous metals. The 1973 investment of $2,071 million represents a decline of $325 million from 1972. Australia, with a relatively modest investment of $216 million in 1972, reduced that level in 1973 by $85 million to $131 million.

Market economy country investments in terms of capital expenditures and exploration expenses for petroleum, by geographic area, are given in table 17. Equivalent data is given by industry sector and type of expense in table 18. The total investment in 1974 for capital expenditures and exploration expenses for petroleum amounted to a record of $45,885 million or $14,190 million more than in 1973, and over 73% more than 1972 expenditures. The distribution of these expenditures in market economy countries for 1973 and 1974 is given in the following tabulation by area in percent of the total:

| Area | Percent of total | |
|---|---|---|
| | 1973 | 1974 |
| United States | r 36.2 | 38.7 |
| Other Western Hemisphere | 11.3 | 11.6 |
| Western Europe | 15.8 | 15.5 |
| Africa | 3.5 | 3.0 |
| Near East | 4.5 | 4.0 |
| Far East | 8.3 | 8.2 |
| Unspecified | r 20.4 | 19.0 |
| Total | 100.0 | 100.0 |

r Revised.

The United States, with the largest percentage of the total, increased its share in 1974, rising to 38.7%. Other Western Hemisphere countries also increased their share slightly from 11.3% to 11.6%, while all other regions listed declined in their percentage of the total. Such data is well in line with developments in 1972 and 1973, which saw nationalization or expropriation of oilfields and refineries, as well as generally unstable conditions for either exploration or development work in many countries, and the concomitant return to the United States of much investment capital. Further analysis of table 17 shows that in terms of actual dollar value every area listed experienced an increase in capital expenditures of between 24% and 56%. Much of the increase simply represents higher costs for facilities of comparable size and complexity undertaken in previous years. Capital expenditures in the United States, increased by nearly $6 billion in 1974, compared with $1.6 billion between 1972 and 1973, while exploration expenses were up 32.9%, exceeding $1 billion for the first time. Capital expenditures for other Western Hemisphere nations increased 49.6%, with exploration expenses up 47.3%. Western Europe and the Far East had increases in capital expenditures of 43.4% and 46.3%, respectively. The Near East, with its large petroleum reserves, increased capital expenditures 27.3%. Capital expenditures for tanker construction continued strong, though at a slower pace than in 1973. Competition for petroleum supplies drove up tanker rates and added pressure to new tanker construction despite signs of saturation of the Very Large Combination Carrier (VLCC) market based on contracts for new tankers under construction or on order. Expenditures in that area were up 34.9%, or $2,250 million.

Capital expenditures in the petroleum industry by industry sector for market economy countries is given in table 18. Expenditures for production of crude oil and natural gas, by far the largest portion of total petroleum industry capital expenditures, nearly doubled from 1972 to $18,765 million in 1974, and increased 51.1% from 1973. Expenditures for marine facilities, which include investment in tanker construction, amounted to $8,900 million, or 19.4% of total expenditures, an increase of 35.9% from 1973. Excluding expenditures in the marketing sector, which declined for the third consecutive year, the investment level increased for every other sector. Pipeline investment doubled from that of 1973, at $2,460 million in 1974, after having remained relatively stable for several years. The amount expended in exploration also was up by 28.5% at $2,185 million. Though accounting for the smallest percentage of the total at $770 million, investment in natural gas plants was up 51%, reflecting development of North Sea gasfields and oilfields, as well as the increase in demand for the utilization of natural gas.

United States direct foreign investment in mineral industries in terms of value, earnings, and income for the 4-year period 1971–74, with detailed country breakdown for the latest 2 years, is given in table 19. Preliminary 1974 data indicate only a slight increase in value of the U.S. investment in foreign mining, smelting, and refining. The value of investment in that sector increased 1.4% overall, with most of the increase again coming from Canadian investment which was up $127 million. Total U.S. investment in mining was below 1973 levels in Latin America and Europe but increased $34 million in other countries of Africa. As regards the Far East and Pacific, the value of investment in Australia increased by $116 million, and in nations included with "Other" also was up for the year. Overall earnings for that sector were up 28.7%, while income improved 28%. United States foreign investment in the petroleum industry fared somewhat better, increasing by 10.8% to $30,248 million. Where data was available for 1973 and 1974, figures indicate general increases for most countries. Investment in Japan and Peru was up 57.6% and 60.4%, respectively. Value of investment in Denmark and Ireland was raised by $152 million, while in the United Kingdom it was up $458 million. The amount allocated for foreign shipping persisted in an upward trend, increasing by $668 million in 1974, but investments in the Near East fell off 24.4%. Preliminary data also report substantial change in the earnings and income from petroleum, up 221% and 275%, respectively, compared with increases of 12.4% and 11.6%, respectively, in 1972.

## TRANSPORTATION

### MARINE TRANSPORT

The large tonnages of mineral commodities which move in international trade are transported primarily by ocean-going vessels of three distinct classes: Tankers, bulk carriers, and freighters. The U.S. Maritime Commission classification of these vessels is given in table 20, listing number of vessels, gross tonnage, and deadweight tonnage for each class for the 5-year period 1970–74. The three prime classes of carriers listed recorded increases in each category but the group under "Other", which includes combination passenger-cargo and combination passenger-refrigerated cargo declined in 1974 in each category. The tables given in this section consider total vessels afloat without regard to end use. Therefore one must consider that vessels in each of the classes are not involved wholly or even partly in the transport of mineral commodities. Tankers generally move crude oil, gas, or refinery products but may also move molten sulfur. Bulk carriers also move substantial quantities of agricultural products in addition to fertilizers and crude minerals while freighters transport metal products as well as some ores and concentrates.

A general idea of the extent of world movement by these vessels can be obtained by viewing tables 21, 22, and 23, which give shipment of tanker and dry cargo by loadings and unloadings over a 5-year period.

Table 21, which lists the total for each category, indicates that tanker cargo loadings were down less than 1.6%, reflecting the reduction in such traffic due to the oil embargo and subsequent doubling and tripling in price of many grades of crude. Dry cargo loadings were up 3.1% but this is considerably below the 15.4% of the previous year, again reflecting the increase in the cost of transportation.

The regional pattern of tanker and dry cargo movement by loadings and unloadings for 1974 reflects the general downturn in various economies during the year, particularly for technologically intensive countries with heavy fuel requirements. Of the three major regions listed, only for the centrally planned economies was there an increase in loadings of tanker cargo, while developing market economies recorded the only increase in unloadings. Loadings of tanker cargo in the United States were reduced to zero, while unloadings declined for the first time since this series of data began. Western Europe, with tanker unloadings of over three times that for the United States, declined 3.2% in 1974. The Near East, the leading supplier of tanker cargo on a regional basis, increased loadings by only 6 million tons compared with 146 million in 1973, while in the Western Hemisphere Venezuela reduced loadings by 8.2%. As in the United States, Japanese unloadings of tanker cargo fell by 6.5% or 18 million tons after years of continually expanding economic growth.

Loadings and unloadings of dry cargo increased in 1974 for every major region listed in table 23 except for centrally planned economies which declined in unloadings by 6.6%. Loadings in market economy countries slowed considerably, with actual declines in Canada and the United States. Loadings in Western Europe were up 5.6% while Australia and New Zealand continued to expand also at 4.7% in 1974. Among developing market economies the area listed as other Latin America had an increase in loadings of 10.9% or 14 million tons, while countries of the Far East reduced loadings by 12 million tons. Developed market economies also experienced substantial reductions in the level of unloadings for that region, up 63 million tons or 5.9% compared with 121 million tons in 1973. Developing market economy countries as a whole increased unloadings by 8.8%, with Other Latin America up nearly 30% at 49 million tons and the Far East up 3% at 104 million tons. After 3 consecutive years of increase, unloadings of dry cargo by the U.S.S.R. were cut in half in 1974 to 12 million tons, thus accounting for the decline in that category by centrally planned economies.

As mentioned previously, not all of the vessels comprising the world's merchant fleet move only mineral commodities, but while data are not available on the percentage of world commodity movement which is mineral commodity in nature, it is possible to obtain a reasonable indication of such by analysis of traffic transiting the Panama Canal.

In 1974 57.6% by weight of all material

passing through the Panama Canal was mineral commodity, compared with 55.6% in 1973. As the capacity limitations of the lock system restrict the size and weight of vessels passing through the canal, it is reasonable to assume that the percentage of total world commodity movement which is minerals related is even larger due to the number and size of tankers and bulk carriers moving petroleum and refinery products that cannot enter the canal.

At yearend 1974 the world merchant fleet[6] totaled 22,449 vessels, with a gross tonnage of 306,366,000 tons and a deadweight tonnage of 503,348,000 tons. These figures represent increases of 3.9%, 11.1%, and 12.8%, respectively, over 1973. The rate of growth continued to vary for the various vessel classes; in terms of number of vessels bulk carriers had the highest percentage increase followed by tankers, while tankers led in percentage growth of both gross tonnage and deadweight tonnage. Freighters remained the largest individual class of vessel despite having the lowest growth rate, comprising 11,449 vessels or 51% of the total, down slightly from 51.7% the previous year. Despite the relatively low growth rates for number and weight of vessels, freighters also showed much improvement in both areas compared with 1973 figures.

**Bulk Carriers.**—In 1974 the world bulk carrier fleet increased by 275 vessels or 7.2%, compared with 261 vessels in 1973. Significantly, the rate of growth of bulk carrier size in both gross tonnage and deadweight tonnage fell behind that for tankers, dropping to 10.3% and 10.4%, respectively, in 1974, compared with growth rates of 15.2% and 16.3%, respectively, for bulk carriers in 1973. Average gross tonnage of individual vessels increased to 20,200 tons, compared with 19,647 tons the previous year, while in terms of deadweight tons the average size moved up to 34,176 tons from 33,195 tons. There has been a marked decline in the number of combined carriers on order after nearly 10 years of rapid growth in response to advantages gained from the relatively newly adopted concept of combined operations. Presumably demand for such vessels has declined as these needs were met, and requests for carriers up to 150,000 deadweight tons are in response to new specific requirements, as in the case of reopening of the Suez Canal.

The following table lists the total number of bulk carriers in service under the major flags of registry ranked in order of aggregate deadweight tonnage for 1974:

| Country | Number of vessels | Deadweight tonnage (thousand tons) |
|---|---|---|
| Liberia | 841 | 32,642 |
| Japan | 542 | 21,196 |
| Norway | 320 | 15,983 |
| United Kingdom | 332 | 13,729 |
| Greece | 479 | 13,133 |
| Italy | 147 | 5,886 |
| Sweden | 90 | 4,839 |
| West Germany | 77 | 3,876 |
| Panama | 183 | 3,621 |
| India | 66 | 2,667 |
| France | 59 | 2,285 |
| Spain | 56 | 1,722 |
| Poland | 71 | 1,479 |
| U.S.S.R. | 150 | 1,421 |
| Singapore | 37 | 1,413 |
| Brazil | 33 | 1,047 |
| Other | 592 | 12,328 |
| Total | 4,075 | 139,267 |

**Freighters.**—Freighters make up the most numerous class of oceangoing vessels, primarily moving smelter and mill products, as well as other processed materials. In 1974 the number of freighters increased 2.5% to 11,449 vessels. Gross tonnage increased 3.1% to 68,855,000 tons, while deadweight tonnage was up 3.3% to 93,476,000 tons. Freighters again declined in percentage of aggregate gross

[6] Oceangoing steamships and motorships of 1,000 gross tons and over.

tonnage, falling to 22.5% from 24.2% the previous year, while in terms of percent of deadweight tonnage the decline was from 20.3% to 18.6%. The reduction in the proportion of the total of these two categories is primarily due to the extensive replacement of available tonnage by tankers and bulk carriers. However, the average vessel size increased slightly from 5,979 gross tons and 8,103 deadweight tons in 1973 to 6,014 gross tons and 8,165 deadweight tons in 1974.

The following tabulation, which lists the principal nations of registry of freighters in order of their share in aggregate deadweight tonnage for 1974, indicates that the U.S.S.R. has moved into first place ahead of Greece in the overall ranking:

| Country | Number of vessels | Deadweight tonnage (thousand tons) |
|---|---|---|
| U.S.S.R | 1,413 | 8,825 |
| Greece | 909 | 8,761 |
| Japan | 951 | 7,783 |
| United States | 589 | 7,261 |
| United Kingdom | 650 | 6,140 |
| Panama | 870 | 5,764 |
| Liberia | 506 | 5,224 |
| West Germany | 460 | 3,839 |
| Cyprus | 465 | 3,246 |
| Norway | 313 | 2,643 |
| Netherlands | 283 | 2,354 |
| China, People's Republic of | 234 | 2,087 |
| Other | 3,856 | 29,549 |
| Total | 11,449 | 93,476 |

**Tankers.**—The number of tankers added to the world merchant fleet in 1974 increased by 6.4% or 308 vessels. In terms of gross tonnage and deadweight tonnage the additions amounted to increases of 17.2% and 18.6%, respectively, and continue to support the trend of increased productivity or carrying capacity. The average size of tankers continued to increase as many of the newer vessels were in the supertanker class, with gross tonnage averaging 28,002 tons and deadweight tonnage 51,053 tons. Comparison with the average size of tankers in 1966 indicates that the deadweight tonnage has nearly doubled, while gross weight of an individual tanker is up 71.3%. The distribution of world oil tanker tonnage by size group for 1974 is given in table 24 and includes a comparison with tanker distribution in 1966. Deadweight tonnage in service at yearend 1974 was 255.8 million tons, 16.3% greater than the previous year. However, for the first time, the share of tankers in the total world order book did not increase significantly, and actual tonnage of new vessel construction in progress or on order at yearend 1974 was 164.4 million deadweight tons, down 16.8% from a record high the previous year. Vessels in the 205,000 to 285,000-deadweight-ton class accounted for the largest percentage of tanker tonnage afloat at 41.2% and for 57.9% of new vessel construction in progress or on order. Assuming all vessels currently in progress or on order are completed, and discounting any losses from existing operational tonnage, the total world tanker fleet will amount to 420.2 million deadweight tons. Information from other sources indicates that the rapid increase of orders for tankers of 400,000 deadweight tons and above has finally subsided, but those few orders which did materialize showed a preference for vessels over 500,000 tons. However, regarding overall tanker construction, world shipyards have been booked since 1969, and the high volume of vessels currently on order indicates that deliveries will remain at a high level until 1976. Port limitations at many developed countries, particularly the United States with a maximum allowable vessel size of 80,000 tons, will provide impetus to continued reliance upon smaller size tankers for transfer of crude and refined products, the latter having had an increase in growth of trade as more producing countries startup or expand their

refining capacity. Specifically, there is renewed interest in construction of tankers under 150,000 deadweight tons, partly because the age of approximately 32% of tankers below that weight class is 15 years or older and because of the expected reopening of the Suez Canal in 1975. Completion of construction of many tankers in recent years, particularly very large carriers, has already resulted in replacement of a large percentage of the fleet. The following tabulation gives the percentage of total tonnage in terms of the year of completion of vessels classified as tankers in 1973 and 1974:

| Year of completion | Percent of total tonnage | |
|---|---|---|
| | 1973 | 1974 |
| Up to yearend 1945 | 2.1 | 1.5 |
| 1946–50 | .9 | .6 |
| 1951–55 | 5.5 | 4.1 |
| 1956–60 | 13.4 | 11.2 |
| 1961–65 | 15.9 | 13.5 |
| 1966–70 | 30.5 | 25.7 |
| 1971–74 | 31.7 | 43.4 |

Source: British Petroleum Co. Ltd. BP Statistical Review of the World Oil Industry, 1973 and 1974. Bayard Press, London, 1973, 1974, p. 14.

The number of tankers with flags of open registry countries continued to expand in 1974. A breakdown of the world tanker fleet at yearend 1974 in terms of flag of registry ranked, in order of national aggregate deadweight tonnage, is shown in the following tabulation:

| Country | Number of vessels | Deadweight tonnage (thousand tons) |
|---|---|---|
| Liberia | 945 | 73,819 |
| United Kingdom | 467 | 31,494 |
| Japan | 520 | 30,707 |
| Norway | 337 | 24,472 |
| Greece | 334 | 14,287 |
| France | 149 | 11,947 |
| United States | 278 | 9,298 |
| Panama | 222 | 8,828 |
| Italy | 229 | 7,012 |
| Germany, West | 84 | 5,568 |
| U.S.S.R | 455 | 5,534 |
| Sweden | 74 | 4,935 |
| Denmark | 60 | 4,580 |
| Spain | 108 | 4,332 |
| Other | 859 | 24,627 |
| Total | 5,121 | 261,440 |

## OCEAN FREIGHT RATES

Indexes of ocean freight rates in terms of trip and time charter for selected countries by cargo type and vessel size are given in table 27. Considerably more detail is now available regarding tanker and dry cargo freight rates by vessel size. No single trend could be determined for the direction of freight rate movement for all the countries listed, but in general rates for western market economy countries declined for tankers, while dry cargo rates increased. Trip charter rates for West German tankers fell 35.3% in 1974, following a nearly threefold increase between 1972 and 1973. Time charter rates for that country for dry cargo shipments climbed 19.8%, but on a quarterly basis they showed a decline throughout the year. Norwegian dry cargo freight rates for trip charter and time charter increased 34.8% and 89%, espectively, over 1973. Rates for the larger vessel sizes decreased for tanker and dry cargo in both Norway and the United Kingdom as high crude oil prices and spreading recession dampened demand, leaving only the smaller carriers in competitive position. The effect of the oil embargo and consequent glut of avail-

able tonnage on centrally planned economy countries was nearly nonexistent, at least as far as freight rates were concerned. Rates were up for the three classes of vessels listed for the past four consecutive years.

## PANAMA AND SUEZ CANALS

In 1974 the number of transits and total cargo moved through the Panama Canal increased by 1.2% and 17.2%, respectively, compared with 1973 figures. Total cargo moved set a new record at 151,927,000 tons as the canal witnessed another year of increase in the average size of ships transiting that waterway, particularly as influenced by the oil embargo and grain shipments to the U.S.S.R. and the PRC. The total number of transits continued to lag behind the levels set at the height of the Vietnam War, but the oil embargo initiated by several major oil producing nations resulted in increased demand and rerouting of crude oil and refinery products through the Panama Canal. The percentage of total cargo moved, which consisted of mineral commodities, increased to 57.6% or 87,500,000 tons, compared with 55.5% or 71,821,000 tons in 1973. Thus an additional 15,679,000 tons or 21.8% was listed as mineral commodity moving through the canal. Mineral commodity movement in comparison with other Panama Canal activity is summarized in the following tabulation:

| | Fiscal years | | |
|---|---|---|---|
| | 1972 | 1973 | 1974 |
| Number of transits: | | | |
| Commercial ocean traffic | 13,766 | 13,841 | 14,033 |
| Other traffic | 1,432 | 1,268 | 1,236 |
| Total | 15,198 | 15,109 | 15,269 |
| Cargo moved (thousand metric tons): | | | |
| Commercial ocean traffic: | | | |
| Mineral commodities | 63,099 | 71,821 | 87,500 |
| Other commodities | 47,999 | 56,087 | 62,626 |
| Subtotal | 111,098 | 127,908 | 150,126 |
| Other traffic, all commodities | 1,873 | 1,481 | 1,801 |
| Total | 112,971 | 129,389 | 151,927 |

Table 25 gives commercial ocean traffic through the Panama Canal in terms of number of transits and total cargo moved by class of vessel for 1973 and 1974. Dry bulk carriers continued to be the primary mover, accounting for nearly half of the total tonnage traversing the Canal and up 23.8% over the 1973 total moved by such vessels. General cargo ships had the highest number of transits, despite the 18.8% drop from the previous year's high, while no combination carriers transited the Canal in 1974. The tonnage moved by tankers was up 38%, with a 30% increase in the number of transits, most of which was from Atlantic to Pacific.

Analysis of mineral commodity movement through the Canal over a 3-year period by commodity and direction of movement is given in table 26. Of the total tonnage of mineral commodities moved, 63.6% by weight was Pacific bound. Several substantial changes occurred in the movement of mineral commodities of historically large volume, particularly fuels. Total transit of crude petroleum was up 45.3% or 5,336,000 tons more than in 1973, while the tonnage of refined products moved was up 33% to 15,362,000 tons.

Coal and coke shipments, largely from the East and Gulf Coast United States, amounted to 18,526,000 tons, up 33.6% over that of 1973. Unlike the previous year when approximately 2.4 million tons bypassed the Canal via the Cape of Good Hope shipping route, an estimated 1.8 million tons bypassed in 1974. The reduction may reflect, in part, the increased cost of operation of vessels on the longer route, particularly during the energy crisis, which drove up the cost of fuel. Pacific-bound shipments of phosphatic fertilizer were up by 623,000 tons as demand for that commodity grew. In general shipments of most major crude ores and

concentrates increased, except in the case of bauxite and alumina, which declined by 427,000 tons. Total movement of copper ores and concentrates was up by 102,000 tons, while the tonnage of zinc ore and concentrate increased to 988,000 tons, up 25.9% from 1973. Iron ore shipments through the Canal increased significantly in both Pacific and Atlantic bound directions, with total tonnage up 629,000 tons or 26.8%.

Prospects appear bright for the reopening of the Suez Canal, possibly by March of 1975. Prior to its closure in 1967 as a result of Arab-Israeli conflict, the canal was a vital trade route, particularly as regard European seaborne imports, one-third of which passed through the Canal. Suez Canal traffic at that time accounted for nearly 14% of total seaborne trade, and its closure, coupled with continued hostility in that region, added extreme impetus to selection of alternative routes or transport methods. The result was a massive expansion in the shipbuilding industry which led to the virtual replacement of a large percentage of the merchant fleet and the creation of a supertanker class of carrier. Expansion plans continued unabated until October 1973, when the oil embargo occurred. Simultaneously plans were being laid to reopen the Suez Canal. Initial clearing operations involved removal of mines, explosives, and abandoned or sunken vessels. Dredging was underway which will allow for the accommodation of tankers of 70,000 deadweight tons laden and 110,000 deadweight tons in ballast. Further widening is expected, and projected transit of both dry and tanker cargo tonnage in 1975 is 120 million tons. In relation to existing trade routes, reopening of the Canal will reduce the length of three principal oil transport routes by 30% to 55%.

## PIPELINES

In 1974 pipeline construction continued to show strong gains, particularly in centrally planned economies. Financing was a major problem in planned pipeline construction and in at least one case shortages of pipe figured significantly in project delays. Although comprehensive summaries of pipeline systems are not available, the following section highlights some of the projects planned or underway in 1974.

In Europe activity remained centered around North Sea developments. Construction continued on the crude line from Ekofisk to Teesside in the United Kingdom while deliveries of natural gas through the Ekofisk to Emden, West Germany, line remained scheduled for late 1975. In the U.S.S.R. plans for 1974 called for the laying of a total of 5,600 miles of oil and gas trunk lines. In addition to the 48-inch, 1,400-mile line from Samotlor to Kuibyshev, a 1,200-mile crude oil line from Subkhankulovo to Novorossisk on the Black Sea was planned. Expansion will be made toward central European U.S.S.R. with gaslines from Komi and Tyumen. However, one major modification in pipeline construction plans was termination of the proposed 2,500-mile crude oil line from Tyumen in West Siberia to Nakhodka on the Pacific. Instead of such a route, crude oil would be piped from Alexandrovskoye in the Tyumen area to a storage area in Central Siberia. From there it would be loaded to a railway, which presumably is already under construction. Thus priority is being given to construction of a second trans-Siberian railroad. Agreement in principal has also been made with COMECON countries for the laying of a 1,900-mile line from the Orenburg gasfield to eastern Europe. In Hungary work began on a 130-mile, 25-inch stretch of the Andria pipeline, which is to supply crude landed at the Bay of Pijeka to refineries in Yugoslavia, Hungary, and Czechoslovakia.

In the Near East the Turkish Petroleum Corp. has asked for postponement of negotiations with Iraq regarding construction of the 620-mile crude oil pipeline from Kirkuk to a terminal in southeast Turkey. The line was expected to supply 25 million tons of Iraq crude per year.

Delays of a legal nature continued to curtail work on the Alaska pipeline, despite the overcoming of numerous technical problems. In anticipation of its eventual startup and completion, however, Costa Rica reportedly has awarded a contract for a 180-mile pipeline from the Pacific Coast to the Atlantic port of Limon to carry Alaska crude to the east coast of the United States. Capacity of the line is to be 1.6 million barrels per day and the project is expected to take 5 years to complete. Preliminary information indicates that Panama may make a similar offering.

Argentina was the primary area of pipeline activity in South America in 1974. In April a 110-mile natural gas line between Mar del Plato and Tandil went into operation with an initial capacity of 2.5 million cubic feet per day, while a 140-mile line from the Monteogudo gasfields to Sucre came onstream with a design capacity of 17.2 million cubic feet per day. A major contract was awarded to a consortium of three United States companies for a 400-mile stretch of trans-Andean pipeline broadly parallel to the Marañon River from San José de Saramuro to the Porculla Pass. The remaining 112-mile link will be laid by an Italian-Argentine company, with completion expected in July 1976. In Peru the 550-mile trans-Andean pipeline from the Corrientes Fields to Bayovar was delayed because of pipe shortages. The completion date for the 36-inch crude line has now been put ahead to January 1977. The line is to have an initial capacity of 200,000 barrels per day, and may be increased to 320,000 barrels per day, but financing continues to be a major problem. Government policy makers in Bolivia are again negotiating for the export of gas to Brazil via a 1,900-mile line from Santa Cruz to São Paulo. Capacity of the line is to be 240 million cubic feet per day.

## PRICES

The price increases which so markedly characterized the major mineral commodity price movements in 1973 were overshadowed by a pricing situation in 1974 which outstripped all previous levels and even the most generous of expectations in the light of continued restricted fuel supplies. Even the relatively quiescent price of lead moved considerably higher in response to related mineral commodity price movement. Despite the paucity of detailed average world price data for steel and other large-volume mineral commodities such as crude oil and refinery products, prices again increased based on general industry information from both suppliers and consumers.

As regards pricing situations for specific mineral commodities, tables 28, 29, and 30 give average annual prices for the 3-year period 1972–74 for several major nonferrous metals on three world markets—the United States, the United Kingdom, and Canada. Also included are average monthly prices for 1974 for these same commodities. The date listed in the tables indicate that, without exception, average annual prices for each of the commodities in each country increased in 1974 with respect to 1973. It should be noted that in Canada aluminum producers continued to cease quoting a published price for that commodity, a practice begun in 1972. Three consecutive years of decline of aluminum prices in the United States was reversed in 1974 when the average annual price increased 36.5% over that of 1973. Prices had fallen 5.3% the previous year but then jumped 16% to 29.0 cents per pound at the beginning of 1974. By mid-1974 the price was at 33.5 cents per pound and continued its upward climb, reaching a high of 39.0 cents per pound at the end of the third quarter which persisted through the remainder of the year. A nearly analogous price movement situation held true for the United Kingdom. After a decline of 3 years, the average annual price of aluminum climbed, with several minor monthly reverses, throughout the year, finishing up 31.8% at 34.690 cents per pound. The pattern of monthly copper price movement was relatively the same for each of the three markets, but the percent change varied considerably. At the start of the year all three markets had price increases of 14% to 17%, with the level in the United Kingdom continuing a strong increase until May when prices began at first a precipitous, then a gradual decline to the end of the year, ending up 15.2% higher than in 1973. A peak price of 137.565 cents per pound was reached in April, 70.2% above the previous year's annual average. In Canada copper prices climbed for the first 6 months, then began a gradual but steady decline through the rest of the year, ending up 24.9% over that of 1973. Copper prices in the United States were up 30.2% over the previous year, but monthly prices were erratic in the first quarter. In January 1974 prices were up 15.7% from the previous year's average, but then declined to 67.950 cents per pound for the next 3 months. In May prices jumped again and continued to a yearly high in July and August. However, in September United

States copper prices began a decline which continued through the last quarter, but the loss was insufficient to wipe out the gains made in the earlier part of the year. Lead prices in the United States and Canada were up 38.4% and 28.0%, respectively, in 1974. United States lead prices increased for the first 6 months, then remained at 24.50 cents per pound for the remainder of the year. Canadian lead prices rose consistently to a high of 21.50 cents per pound in May and remained at this level. Lead prices in the United Kingdom were more erratic, increasing during the first quarter, then declining for four successive months with a mild rebound in August, then falling again for 3 months but ending the year up in December. Despite such mild declines, the magnitude of the increases was predominant, boosting the annual average 38.3% for the year. Zinc prices for all three countries were up considerably, with average annual price increases of 74.0% for the United States, 46.1% for the United Kingdom, and 45.9% for Canada. United States prices were up for every month except May and November, while United Kingdom prices increased until June when a decline occurred, which brought the average monthly price of zinc down to nearly half the level posted in January. Canadian prices were either up or stable for each month, with December prices up 19.4% over the January level. Tin prices continued to stage major increases, climbing 75.5% in the United States in 1974 compared with 28.7% in 1973. United Kingdom prices were up 70.3%, despite three consecutive months of decline in the third quarter. Silver prices, which had increased approximately 51% in 1973 for both the United States and the United Kingdom, again jumped dramatically. United States silver prices closed the year up 84.4%, while United Kingdom prices were up 85%. No yearly average was reported for Canadian silver prices in 1973, but by yearend 1974, prices were up 19.7% from the beginning of the year.

The mineral commodity export price indexes given in table 31 list export price indexes for metal ores and fuels, as well as an index for all crude minerals combined. The price index for exported crude minerals jumped 296 index points (1963= 100) or 164% in 1974 over that of 1973. Increases were recorded for each consecutive quarter, with the fourth quarter index at 486. Even more spectacular was the export price index for fuels, which was up 194%, or 365 index points over the 1973 level. The price index for fuels also increased each consecutive quarter, ending the year at an all-time high of 565. Metal ores, which were up 20.2% in 1973, climbed another 34.2% in the commodity price boom which highlighted 1974. The metal ores export price index reached a high of 231 in the second quarter of 1974, but then tapered off to 207 at yearend.

The United Nations analysis of export price indexes given in table 32 breaks down price indexes for developed and developing areas in terms of total minerals and nonferrous base metals. The annual average export price index for total minerals for developing areas increased from 178 in 1973 to 536 in 1974, a record 201%. The export price index for nonferrous base metals for that same area also increased at 26.6%, but this was considerably below the 56.5% registered in 1973. It can be seen that the index dropped drastically from 407 in the second quarter to 233 by yearend. Developed areas registered a 26.1% increase in the nonferrous base metals index, with the high for the year occurring in the second quarter, while the index for total minerals was up 69.1%. Unlike the price indexes for the developing areas, which attained their greatest momentum in the first half of the year, the index for total minerals for developed areas shows a longer lead time for prices to reach their maximum, which took place in the final quarter.

## STATISTICAL SUMMARY OF WORLD PRODUCTION AND TRADE OF MAJOR COMMODITIES

The final 31 tables in this chapter (tables 33 to 63) extend the statistical series that was started in the 1963 edition of the International Area Reports volume of the Minerals Yearbook and that was subsequently updated in the 1965 and 1967–73 editions. They are primarily a supplement to other statistical data within this chapter but also serve as a summary of international production and trade data for

major commodities covered in greater detail on a commodity basis in Volume I of the 1974 Minerals Yearbook and on a country basis in the balance of Volume III.

The data presented here on production (tables 33 to 51) in most instances correspond to the commodity world production tables appearing in Volume I of 1974 Minerals Yearbook, and as such may not correspond exactly with figures presented in the individual country chapters of Volume III. Such differences are usually the result of the receipt of revised data for inclusion in one chapter subsequent to the completion of the other chapter. In most cases, the individual country chapters were prepared later, and therefore should be regarded as more reliable.

The data on world trade in major commodities presented in this chapter (tables 52 to 63) may not correspond exactly to those presented elsewhere in Volume III of the Minerals Yearbook because these summary tables are compiled at least in part from sources other than those used in the individual country chapters in order to obtain data on a consistent basis. The differences, however, are regarded as unimportant from the viewpoint of indicating the general pattern of trade in these commodities. It should be noted that table 58, covering manganese trade is a new addition to this chapter.

**Table 1.—United Nations indexes of world [1] mineral industry production**
(1970=100)

| Industry sector and geographic area | 1972 | 1973 | 1974 | 1974 by quarters 1st | 2d | 3d | 4th |
|---|---|---|---|---|---|---|---|
| EXTRACTIVE INDUSTRIES | | | | | | | |
| Metals: | | | | | | | |
| Market Economy Countries | 99 | 103 | 105 | 103 | 106 | 104 | 107 |
| Developed [2] | 95 | 100 | 99 | 96 | 101 | 98 | 101 |
| United States and Canada | 93 | 102 | 100 | 95 | 106 | 98 | 103 |
| Europe | 85 | 83 | 76 | 73 | 79 | 72 | 83 |
| European Economic Community [3] | 93 | 90 | 85 | 93 | 86 | 73 | 88 |
| European Free Trade Association [4] | 107 | 117 | 124 | 127 | 128 | 109 | 130 |
| Australia and New Zealand | 101 | 97 | 97 | 90 | 90 | 111 | 99 |
| Developing [5] | 104 | 108 | 114 | 113 | 115 | 113 | 116 |
| Latin America [6] | 104 | 108 | 118 | 118 | 117 | 117 | 120 |
| Asia [7] | 98 | 96 | 93 | 92 | 95 | 93 | 93 |
| Centrally Planned Economy Countries (Europe) [8] | 114 | 122 | 126 | 128 | 126 | 126 | 123 |
| World | 102 | 108 | 110 | 108 | 111 | 109 | 111 |
| Coal: | | | | | | | |
| Market Economy Countries | 111 | 121 | 126 | 124 | 128 | 125 | 126 |
| Developed [2] | 89 | 87 | 82 | 81 | 85 | 80 | 84 |
| United States and Canada | 101 | 101 | 102 | 107 | 108 | 102 | 89 |
| Europe | 85 | 83 | 76 | 73 | 79 | 72 | 83 |
| European Economic Community [3] | 83 | 81 | 74 | 70 | 76 | 69 | 80 |
| European Free Trade Association [4] | 101 | 96 | 97 | 103 | 96 | 89 | 98 |
| Australia and New Zealand | 115 | 116 | 122 | 103 | 124 | 136 | 124 |
| Developing [5] | 105 | 107 | 113 | 113 | 108 | 115 | 118 |
| Latin America [6] | 108 | 109 | 121 | NA | NA | NA | NA |
| Asia [7] | 87 | 81 | 81 | 81 | 79 | 81 | 83 |
| Centrally Planned Economy Countries (Europe) [8] | 105 | 107 | 108 | 111 | 108 | 106 | 111 |
| World | 97 | 96 | 96 | 95 | 96 | 93 | 98 |
| Crude petroleum and natural gas: | | | | | | | |
| Market Economy Countries | 111 | 121 | 126 | 124 | 128 | 125 | 126 |
| Developed [2] | 110 | 112 | 112 | 116 | 111 | 107 | 114 |
| United States and Canada | 104 | 104 | 103 | 105 | 103 | 101 | 101 |
| Europe | 141 | 160 | 167 | 186 | 152 | 138 | 193 |
| European Economic Community [3] | 147 | 166 | 176 | 197 | 159 | 143 | 206 |
| European Free Trade Association [4] | NA | NA | NA | NA | NA | NA | NA |
| Australia and New Zealand [9] | -- | -- | -- | -- | -- | -- | -- |
| Developing [5] | 112 | 127 | 136 | 129 | 140 | 138 | 135 |
| Latin America [6] | 96 | 102 | 99 | 101 | 97 | 98 | 98 |
| Asia [7] | 127 | 149 | 163 | 152 | 170 | 165 | 167 |
| Centrally Planned Economy Countries (Europe) [8] | 114 | 122 | 131 | 134 | 134 | 129 | 128 |
| World | 112 | 121 | 127 | 126 | 129 | 126 | 127 |
| Total extractive industry: | | | | | | | |
| Market Economy Countries | 105 | 112 | 115 | 113 | 117 | 114 | 117 |
| Developed [2] | 109 | 119 | 120 | 120 | 122 | 117 | 119 |
| United States and Canada | 101 | 104 | 103 | 104 | 105 | 102 | 102 |
| Europe | 97 | 100 | 99 | 99 | 100 | 92 | 105 |
| European Economic Community [3] | 106 | 114 | 116 | 97 | 97 | 89 | 103 |
| European Free Trade Association [4] | 104 | 111 | 115 | 103 | 96 | 89 | 98 |

See footnotes at end of table.

## Table 1.—United Nations indexes of world [1] mineral industry production—Continued
(1970=100)

| Industry sector and geographic area | 1972 | 1973 | 1974 | 1974 by quarters | | | |
|---|---|---|---|---|---|---|---|
| | | | | 1st | 2d | 3d | 4th |
| EXTRACTIVE INDUSTRIES—Continued | | | | | | | |
| Total extractive industry—Continued | | | | | | | |
| Market Economy Countries—Continued | | | | | | | |
| Developed [2]—Continued | | | | | | | |
| Australia and New Zealand | 131 | 133 | 140 | 132 | 135 | 143 | 148 |
| Developing [5] | 115 | 126 | 137 | 128 | 136 | 139 | 144 |
| Latin America [6] | 99 | 105 | 107 | 107 | 104 | 108 | 110 |
| Asia [7] | 122 | 140 | 152 | 143 | 157 | 153 | 154 |
| Centrally Planned Economy Countries (Europe) [2] | 113 | 120 | 125 | 128 | 126 | 123 | 123 |
| World | 107 | 114 | 118 | 117 | 120 | 117 | 119 |
| PROCESSING INDUSTRIES | | | | | | | |
| Base metals: | | | | | | | |
| Market Economy Countries | 105 | 118 | 119 | 122 | 123 | 116 | 117 |
| Developed [2] | 104 | 117 | 118 | 121 | 121 | 113 | 115 |
| United States and Canada | 105 | 117 | 116 | 121 | 123 | 110 | 109 |
| Europe | 102 | 112 | 116 | 119 | 118 | 110 | 118 |
| European Economic Community [3] | 99 | 109 | 112 | 116 | 113 | 106 | 113 |
| European Free Trade Association [4] | 105 | 110 | 113 | 117 | 118 | 102 | 115 |
| Australia and New Zealand | 101 | 107 | 108 | 110 | 94 | 109 | 119 |
| Developing [5] | 119 | 127 | 140 | NA | NA | NA | NA |
| Latin America [6] | 125 | 135 | 150 | 141 | 156 | 155 | 150 |
| Asia [7] | 127 | 129 | 134 | 129 | 129 | 127 | 121 |
| Centrally Planned Economy Countries (Europe) [8] | 112 | 120 | 127 | 129 | 127 | 126 | 125 |
| World | 107 | 119 | 122 | 124 | 124 | 119 | 119 |
| Nonmetallic mineral products: | | | | | | | |
| Market Economy Countries | 117 | 126 | 135 | 135 | 138 | 131 | 136 |
| Developed [2] | 111 | 121 | 119 | 116 | 124 | 119 | 116 |
| United States and Canada | 112 | 123 | 119 | 115 | 125 | 124 | 113 |
| Europe | 111 | 119 | 119 | 114 | 125 | 117 | 119 |
| European Economic Community [3] | 110 | 116 | 115 | 111 | 122 | 112 | 114 |
| European Free Trade Association [4] | 110 | 118 | 119 | 116 | 123 | 114 | 115 |
| Australia and New Zealand | 111 | 119 | 118 | 112 | 124 | 123 | 114 |
| Developing [5] | 118 | 130 | 141 | 130 | 142 | 147 | 144 |
| Latin America [6] | 112 | 123 | 119 | 115 | 125 | 124 | 113 |
| Asia [7] | 128 | 127 | 130 | 124 | 125 | 123 | 117 |
| Centrally Planned Economy Countries (Europe) [8] | 117 | 126 | 135 | 135 | 138 | 131 | 136 |
| World | 114 | 124 | 127 | 124 | 131 | 126 | 126 |
| Chemicals, petroleum, and coal products: | | | | | | | |
| Market Economy Countries | 120 | 134 | 147 | 146 | 148 | 146 | 146 |
| Developed [2] | 115 | 127 | 130 | 131 | 134 | 129 | 126 |
| United States and Canada | 116 | 126 | 128 | 127 | 132 | 131 | 124 |
| Europe | 113 | 126 | 132 | 135 | 138 | 126 | 129 |
| European Economic Community [3] | 112 | 125 | 130 | 134 | 136 | 123 | 125 |
| European Free Trade Association [4] | 112 | 120 | 125 | 129 | 130 | 118 | 123 |
| Australia and New Zealand | 114 | 127 | 134 | 122 | 137 | 140 | 134 |
| Developing [5] | 117 | 127 | 136 | 124 | 130 | 135 | 153 |
| Latin America [6] | 127 | 132 | 131 | 124 | NA | NA | NA |
| Asia [7] | 123 | 125 | 144 | 126 | 121 | 122 | 137 |
| Centrally Planned Economy Countries (Europe) [8] | 120 | 134 | 147 | 146 | 148 | 146 | 146 |
| World | 116 | 129 | 134 | 134 | 137 | 133 | 133 |
| OVERALL INDUSTRIAL PRODUCTION | | | | | | | |
| Market Economy Countries | 109 | 120 | 122 | 121 | 124 | 120 | 122 |
| Developed [2] | 109 | 119 | 120 | 120 | 122 | 117 | 119 |
| United States and Canada | 109 | 119 | 119 | 119 | 121 | 120 | 116 |
| Europe | 108 | 116 | 119 | 120 | 122 | 110 | 123 |
| European Economic Community [3] | 106 | 114 | 116 | 117 | 118 | 108 | 120 |
| Europe Free Trade Association [4] | 107 | 114 | 117 | 118 | 121 | 108 | 123 |
| Australia and New Zealand | 110 | 118 | 122 | 117 | 123 | 127 | 121 |
| Developing [5] | 115 | 126 | 137 | 128 | 136 | 139 | 144 |
| Latin America [6] | 116 | 126 | 137 | NA | NA | NA | NA |
| Asia [7] | 112 | 129 | 131 | 131 | 132 | 131 | 132 |
| Centrally Planned Economy Countries (Europe) [8] | 118 | 129 | 140 | 140 | 143 | 138 | 139 |
| World | 112 | 122 | 127 | 126 | 129 | 125 | 127 |

NA Not available.
[1] Excludes Albania, People's Republic of China, Mongolia, North Korea and North Vietnam.
[2] Canada, the United States, all countries of Europe except those listed in footnotes 1 and 8, the Republic of South Africa, Israel, Japan, Australia and New Zealand.
[3] Belgium, Denmark, France, West Germany, Ireland, Italy, Luxembourg, the Netherlands, and the United Kingdom.
[4] Austria, Norway, Portugal, Sweden, and Switzerland.
[5] Countries not indicated in footnotes 1, 2, and 8.
[6] Corresponds to the United Nations classifications "Caribbean, Central and South America."
[7] Corresponds to the United Nations classifications "Asia, excluding Israel and Japan."
[8] Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the U.S.S.R.
[9] Reported as zero in source, but both Australia and New Zealand produce natural gas; insufficient data available to calculate index number.

Source: United Nations. Monthly Bulletin of Statistics, August 1975, pp. xii–xxv.

## Table 2.—World production [1] of major mineral commodities

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite ---- thousand metric tons | r 64,984 | 69,959 | 78,256 |
| Alumina ---- do | r 23,492 | 26,422 | 28,801 |
| Unalloyed ingot metal ---- do | r 11,012 | 12,155 | 13,171 |
| Antimony ---- do | 67 | 70 | 71 |
| Arsenic, white [2] ---- do | r 41 | 46 | 50 |
| Beryl [2] ---- metric tons | r 3,928 | 3,595 | 3,608 |
| Bismuth [2] ---- do | r 3,995 | 3,763 | 3,881 |
| Cadmium ---- do | r 16,666 | 17,131 | 17,037 |
| Chromite ---- thousand metric tons | r 6,101 | 6,726 | 7,195 |
| Cobalt: | | | |
| Mine [2] ---- metric tons | r 24,835 | 26,551 | 30,394 |
| Refined ---- do | r 20,283 | 22,407 | 25,296 |
| Columbium-tantalum concentrates [3] ---- do | r 15,565 | 24,403 | 24,087 |
| Copper: | | | |
| Mine [2] ---- thousand metric tons | r 6,643 | 7,120 | 7,352 |
| Smelter ---- do | r 6,717 | 7,196 | 7,392 |
| Gold ---- thousand troy ounces | r 44,843 | 42,998 | 39,780 |
| Iron and steel: | | | |
| Iron ore ---- thousand metric tons | r 777,884 | 849,930 | 893,453 |
| Pig iron [4] ---- do | 453,715 | 500,909 | 513,951 |
| Ferroalloys [4] ---- do | r 9,959 | 10,756 | 11,257 |
| Crude steel ---- do | r 628,695 | 697,231 | 706,798 |
| Lead: | | | |
| Mine ---- do | r 3,446 | 3,516 | 3,488 |
| Smelter ---- do | r 3,378 | 3,444 | 3,466 |
| Magnesium ---- do | r 234 | 242 | [5] 128 |
| Manganese ore ---- do | r 20,821 | 22,290 | 21,692 |
| Mercury ---- thousand 76-pound flasks | r 279 | 268 | 262 |
| Molybdenum ---- metric tons | r 80,931 | 83,516 | 85,400 |
| Nickel ---- thousand metric tons | r 611 | 687 | 749 |
| Platinum-group metals ---- thousand troy ounces | r 4,270 | 5,240 | 5,760 |
| Selenium [6] ---- metric tons | r 1,234 | 1,191 | 1,189 |
| Silver ---- thousand troy ounces | r 301,510 | 308,584 | 295,562 |
| Tellurium [3] ---- metric tons | r 180 | 202 | 164 |
| Tin: | | | |
| Mine [2] ---- thousand long tons | 240 | 232 | 228 |
| Smelter ---- do | 236 | 228 | 226 |
| Titanium concentrates: | | | |
| Ilmenite [3] ---- thousand metric tons | r 2,452 | 2,702 | 2,857 |
| Rutile [2 3] ---- do | 319 | 340 | 335 |
| Tungsten, mine output, metal content ---- metric tons | r 38,534 | 38,170 | 37,357 |
| Uranium oxide ($U_3O_8$) [3] ---- do | r 23,267 | 23,256 | 21,932 |
| Vanadium [3] ---- do | r 18,361 | 19,625 | 20,093 |
| Zinc: | | | |
| Mine ---- thousand metric tons | r 5,463 | 5,712 | 5,795 |
| Smelter ---- do | r 5,131 | 5,305 | 5,414 |
| **NONMETALS** | | | |
| Asbestos ---- do | r 3,777 | 4,093 | 4,115 |
| Barite ---- do | r 3,955 | 4,239 | 4,345 |
| Cement, hydraulic ---- do | r 656,652 | 701,294 | 704,084 |
| Diamond: | | | |
| Gem ---- thousand carats | r 12,688 | 12,477 | 12,519 |
| Industrial ---- do | r 31,249 | 30,663 | 31,566 |
| Diatomite ---- thousand metric tons | r 1,571 | 1,624 | 1,702 |
| Feldspar ---- do | r 2,716 | 2,715 | 2,880 |
| Fluorspar ---- do | r 4,529 | 4,576 | 4,611 |
| Graphite [2] ---- do | r 361 | 371 | 391 |
| Gypsum ---- do | r 58,486 | 61,560 | 59,973 |
| Magnesite [2] ---- do | r 8,966 | 9,067 | 9,249 |
| Mica [3] ---- do | r 231 | 248 | 236 |
| Nitrogen fertilizers, contained nitrogen [7] ---- do | r 35,028 | 37,923 | 40,852 |
| Phosphate rock ---- do | r 90,031 | 98,781 | 110,381 |
| Potash (marketable), $K_2O$ equivalent ---- | r 20,012 | 22,042 | 23,668 |
| Pumice [3] ---- do | r 15,601 | 14,874 | 13,083 |
| Salt ---- do | r 146,413 | 151,193 | 157,266 |
| Strontium minerals [3] ---- metric tons | r 100,154 | 93,261 | 97,804 |
| Sulfur, elemental: [8] | | | |
| Frasch and from ores ---- thousand metric tons | 14,125 | 16,128 | 18,059 |
| Content of pyrite [9] ---- do | 10,721 | 10,641 | 10,676 |
| Byproduct ---- do | 20,520 | 22,276 | 22,825 |
| Total ---- do | 45,366 | 49,045 | 51,560 |
| Talc, soapstone, pyrophyllite ---- do | r 4,830 | r 5,269 | 5,464 |
| Vermiculite [3] ---- do | 465 | 498 | 503 |

See footnotes at end of table.

## Table 2.—World production [1] of major mineral commodities—Continued

| Commodity | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Coal: [10] | | | | |
| Anthracite | million metric tons | 175 | 176 | 187 |
| Bituminous | do | [r] 2,049 | 2,094 | 2,110 |
| Lignite | do | [r] 793 | 819 | 833 |
| Total | do | [r] 3,017 | 3,089 | 3,130 |
| Coke: | | | | |
| Metallurgical | thousand metric tons | [r] 340,525 | 368,547 | 370,804 |
| Other types | do | [r] 18,172 | 17,627 | 17,590 |
| Fuel briquets | do | 94,713 | 86,761 | 90,266 |
| Gas, natural, marketed | billion cubic feet | [r] 43,425 | 46,139 | 47,130 |
| Peat | thousand metric tons | [r] 200,618 | 199,737 | 199,893 |
| Petroleum, crude | million barrels | [r] 18,601 | 20,368 | 20,516 |

[p] Preliminary. [r] Revised.

[1] Incorporates numerous revisions from world production tables and country production table appearing in Volumes I and III, respectively, of the Minerals Yearbook as well as in the corresponding table in previous editions of this chapter.

[2] U.S. production withheld to avoid disclosing individual company confidential data.

[3] Excludes production from centrally planned economy countries: Albania, Bulgaria, the People's Republic of China, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, North Korea, North Vietnam, Poland, Romania, the U.S.S.R. and Yugoslavia, except in the case of vanadium which includes a figure for the U.S.S.R. alone.

[4] Data presented for pig iron includes relatively small quantities of ferroalloys (not duplicating quantities reported under ferroalloys) produced in a few countries that do not report ferroalloys production separately from pig iron production.

[5] Excludes portion produced in the United States which in previous years accounted for approximately 50% of the total.

[6] Excludes production from countries listed in footnote 3 except for Yugoslavia.

[7] Years ending June 30 of that stated.

[8] Series revised from that published in previous editions to include additional forms of sulfur not previously reported, including most prominently, sulfur content of pyrite. Other forms of sulfur incorporated include sulfur recovered directly as acid from metallurgy and sulfur content of gypsum used for production of sulfur and/or sulfur compounds.

[9] Pyrite heretofore has been reported separately, and on a gross weight basis rather than in terms of sulfur content. Gross weight figures corresponding to the sulfur content figures entered here were as follows, in thousand metric tons: 1972—[r] 22,856; 1973—22,914; 1974—23,640.

[10] Production of coal by some countries is not reported divided into the three categories listed; such output has been distributed to the three listed grades according to best available information from supplementary sources relating to the quality of such coals.

## Table 3.—Approximate percentage distribution of world mineral commodity production by major areas in 1974 [1]

| Commodity | Western Hemisphere | | | Eastern Hemisphere | | | | | | | World | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Europe | | | Near East and Asia | | | | | |
| | North and Central America [2] | South America | Total | Market economy [3] | Centrally planned economy [4] | Africa | Market economy [5] | Centrally planned economy [6] | Oceania | Total | Market economy | Centrally planned economy |
| **METALS** | | | | | | | | | | | | |
| **Aluminum:** | | | | | | | | | | | | |
| Bauxite | 24.7 | 13.9 | 38.6 | 10.5 | 9.8 | 9.7 | 5.0 | 0.8 | 25.6 | 61.4 | 89.4 | 10.6 |
| Alumina | 38.0 | 6.9 | 44.9 | 14.5 | 12.5 | 2.3 | 7.8 | 1.0 | 17.0 | 55.1 | 86.5 | 13.5 |
| Aluminum ingot | 41.8 | 1.6 | 43.4 | 25.0 | 14.8 | 2.1 | 11.1 | 1.1 | 2.5 | 56.6 | 84.1 | 15.9 |
| Antimony, mine output | 7.6 | 19.9 | 27.5 | 5.9 | 11.3 | 25.1 | 11.4 | 16.7 | 2.1 | 72.5 | 72.0 | 28.0 |
| Arsenic, white [7] | [7] 19.1 | 3.0 | 22.1 | 49.4 | 14.7 | 13.4 | .4 | -- | -- | 77.2 | 85.3 | 14.7 |
| Beryllium, beryl concentrate [7] | ([7]) | 35.3 | 35.3 | .1 | 45.3 | 14.5 | -- | -- | 4.8 | 64.7 | 54.7 | 45.3 |
| Bismuth, mine output [7] | [7] 15.8 | 33.9 | 49.7 | 5.2 | 3.6 | .1 | 24.6 | 6.4 | 10.9 | 50.3 | 90.0 | 10.0 |
| Cadmium, smelter output | 26.5 | 1.4 | 27.9 | 26.7 | 19.4 | 2.5 | 18.0 | 1.2 | 4.3 | 72.1 | 79.4 | 20.6 |
| Chromium, chromite | .3 | 1.8 | 2.1 | 2.5 | 36.3 | 36.8 | 22.3 | -- | -- | 97.9 | 63.4 | 36.6 |
| **Cobalt:** | | | | | | | | | | | | |
| Mine output | 11.7 | -- | 11.7 | 4.2 | 5.7 | 73.9 | 2.0 | -- | 2.5 | 88.3 | 88.9 | 11.1 |
| Smelter output | 3.9 | -- | 3.9 | 12.1 | 6.8 | 77.2 | -- | -- | -- | 96.1 | 93.2 | 6.8 |
| Columbium-tantalum concentrates [8] | 17.0 | 75.1 | 92.1 | .1 | NA | 6.3 | .7 | NA | .8 | 7.9 | 100.0 | NA |
| **Copper:** | | | | | | | | | | | | |
| Mine output | 32.4 | 15.4 | 47.9 | 3.8 | 14.3 | 20.2 | 6.2 | 1.6 | 6.0 | 52.1 | 84.0 | 16.0 |
| Smelter output | 27.7 | 11.7 | 39.4 | 8.5 | 14.1 | 19.4 | 14.5 | 1.5 | 2.6 | 60.6 | 84.4 | 15.6 |
| Gold, mine output | 7.7 | 1.9 | 9.6 | .9 | 18.6 | 64.7 | 2.4 | .5 | 3.3 | 90.4 | 80.9 | 19.1 |
| **Iron:** | | | | | | | | | | | | |
| Iron ore, gross weight | 16.1 | 13.1 | 29.2 | 14.1 | 26.3 | 7.1 | 4.5 | 7.7 | 11.1 | 70.8 | 66.0 | 34.0 |
| Pig iron | 19.2 | 1.5 | 20.7 | 25.8 | 24.6 | 1.0 | 19.6 | 6.9 | 1.4 | 79.3 | 68.5 | 31.5 |
| Ferroalloys [9] | 21.2 | 2.4 | 23.6 | 33.9 | 13.5 | 5.7 | 22.5 | NA | .8 | 76.4 | 86.5 | 13.5 |
| Crude steel | 21.3 | 1.8 | 23.1 | 26.1 | 26.3 | .9 | 18.2 | 4.3 | 1.1 | 76.9 | 69.4 | 30.6 |
| **Lead:** | | | | | | | | | | | | |
| Mine output | 33.7 | 8.1 | 41.8 | 12.0 | 20.3 | 5.3 | 4.0 | 5.8 | 10.8 | 58.2 | 73.9 | 26.1 |
| Smelter output | 27.3 | 5.1 | 32.4 | 21.6 | 21.3 | 3.4 | 5.7 | 5.8 | 9.8 | 67.6 | 72.9 | 27.1 |
| Magnesium, smelter output | [7] 4.6 | -- | 4.6 | 40.8 | 46.8 | -- | 7.0 | .8 | -- | 95.4 | 52.4 | 47.6 |
| Manganese ore, gross weight | 1.8 | 8.5 | 10.3 | .3 | 39.7 | 30.4 | 7.6 | 4.6 | 7.1 | 89.7 | 55.7 | 44.3 |
| Mercury, mine output | 14.2 | 1.8 | 16.0 | 41.0 | 28.3 | 5.2 | 4.6 | 9.6 | -- | 84.0 | 66.8 | 33.2 |
| Molybdenum, mine output | 75.2 | 12.3 | 87.5 | -- | 10.5 | -- | .2 | 1.8 | -- | 12.5 | 87.7 | 12.3 |
| Nickel, mine output [9] | 46.5 | .5 | 47.0 | 4.2 | 17.4 | 5.1 | 3.6 | NA | 22.7 | 53.0 | 78.4 | 21.6 |
| Platinum-group metals, mine output [9] | 6.5 | .5 | 7.0 | -- | 43.4 | 49.3 | .3 | NA | ([10]) | 93.0 | 56.6 | 43.4 |
| Selenium, smelter output [8] | 51.3 | .7 | 52.0 | 13.9 | NA | -- | 30.5 | NA | 3.6 | 48.0 | 100.0 | NA |
| Silver, mine output | 39.7 | 18.9 | 58.6 | 7.5 | 18.0 | 3.5 | 4.0 | .5 | 7.9 | 41.4 | 81.5 | 18.5 |
| Tellurium, smelter output [8] | 67.7 | 16.6 | 84.3 | -- | NA | -- | 15.7 | NA | -- | 15.7 | 100.0 | NA |
| **Tin:** | | | | | | | | | | | | |
| Mine output [7] | .3 | 14.6 | 14.9 | 1.9 | 13.6 | 6.7 | 49.6 | 8.9 | 4.4 | 85.1 | 77.5 | 22.5 |
| Smelter output | 2.8 | 5.2 | 8.0 | 10.3 | 13.6 | 3.4 | 52.8 | .9 | 2.9 | 92.0 | 77.4 | 22.6 |

See footnotes at end of table.

Table 3.—Approximate percentage distribution of world mineral commodity production by major areas in 1974 [1]—Continued

| Commodity | Western Hemisphere | | | Eastern Hemisphere | | | | | | | World | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Europe | | | Near East and Asia | | | | | |
| | North and Central America [2] | South America | Total | Market economy [3] | Centrally planned economy [4] | Africa | Market economy [5] | Centrally planned economy [6] | Oceania | Total | Market economy | Centrally planned economy |
| METALS—Continued | | | | | | | | | | | | |
| Titanium concentrate: | | | | | | | | | | | | |
| Ilmenite [8] | 23.6 | .2 | 23.8 | 35.0 | NA | -- | 12.3 | NA | 28.9 | 76.2 | 100.0 | NA |
| Rutile [8] | 1.7 | .1 | 1.8 | -- | NA | -- | 1.9 | NA | 96.3 | 98.2 | 100.0 | NA |
| Tungsten, mine output | 13.6 | 10.7 | 24.3 | 7.0 | 20.6 | 1.8 | 14.9 | 28.5 | 2.9 | 75.7 | 50.9 | 49.1 |
| Uranium oxide ($U_3O_8$) [8] | 67.2 | .2 | 67.4 | 10.0 | NA | 22.6 | -- | NA | -- | 32.6 | 100.0 | NA |
| Vanadium [9] | 22.0 | 1.4 | 23.4 | 11.3 | 19.4 | 45.9 | -- | NA | -- | 76.6 | 80.6 | 19.4 |
| Zinc: | | | | | | | | | | | | |
| Mine output | 33.0 | 9.3 | 42.3 | 14.8 | 18.0 | 5.1 | 7.5 | 4.5 | 7.8 | 57.7 | 77.5 | 22.5 |
| Smelter output | 19.7 | 2.6 | 22.3 | 29.0 | 19.6 | 3.5 | 16.3 | 4.2 | 5.1 | 77.7 | 76.2 | 23.8 |
| NONMETALS | | | | | | | | | | | | |
| Asbestos | 42.7 | 1.1 | 43.8 | 4.1 | 33.1 | 10.9 | 1.6 | 5.1 | 1.4 | 56.2 | 61.8 | 38.2 |
| Barite | 31.4 | 7.0 | 38.4 | 25.5 | 12.4 | 3.5 | 13.0 | 7.0 | .2 | 61.6 | 80.6 | 19.4 |
| Cement, hydraulic | 14.3 | 4.6 | 18.9 | 28.4 | 24.2 | 3.1 | 19.7 | 4.8 | .9 | 81.1 | 70.8 | 29.2 |
| Diamond: | | | | | | | | | | | | |
| Gem [9] | -- | 3.7 | 3.7 | -- | 15.6 | 80.5 | .2 | NA | -- | 96.3 | 84.4 | 15.6 |
| Industrial [9] | -- | 1.9 | 1.9 | -- | 24.9 | 73.2 | ([10]) | NA | -- | 98.1 | 75.1 | 24.9 |
| Diatomite [9] | 38.7 | 1.4 | 40.1 | 35.3 | 23.5 | .4 | .2 | NA | .5 | 59.9 | 76.5 | 23.5 |
| Feldspar [9] | 30.4 | 5.3 | 35.7 | 45.6 | 11.1 | 1.9 | 5.6 | NA | .1 | 64.3 | 88.9 | 11.1 |
| Fluorspar | 31.0 | 2.9 | 33.9 | 25.1 | 13.9 | 6.1 | 9.2 | 11.8 | ([10]) | 66.1 | 74.3 | 25.7 |
| Graphite [7] | [7] 17.4 | 1.0 | 18.4 | 12.9 | 22.4 | 4.6 | 14.3 | 27.4 | -- | 81.6 | 50.2 | 49.8 |
| Gypsum | 34.0 | 2.6 | 36.6 | 37.7 | 11.1 | 2.5 | 9.0 | 1.1 | 2.0 | 63.4 | 87.8 | 12.2 |
| Magnesite [7] | [7] .3 | 3.4 | 3.7 | 35.0 | 23.7 | 1.0 | 6.8 | 29.5 | .3 | 96.3 | 46.8 | 53.2 |
| Mica [8] | 53.4 | 2.1 | 55.5 | 4.3 | 17.3 | 2.1 | 20.8 | NA | -- | 44.5 | 82.7 | 17.3 |
| Nitrogen fertilizers, contained N | 25.7 | 1.1 | 26.8 | 24.4 | 27.5 | 1.1 | 13.0 | 6.7 | .5 | 73.2 | 65.7 | 34.3 |
| Phosphate rock | 37.9 | .3 | 38.2 | .1 | 20.4 | 30.1 | 2.8 | 4.2 | 4.2 | 61.8 | 75.4 | 24.6 |
| Potash, $K_2O$ equivalent (marketable) | 33.1 | .1 | 33.2 | 23.7 | 37.8 | 1.3 | 2.6 | 1.4 | -- | 66.8 | 60.8 | 39.2 |
| Pumice [8] | 30.7 | 1.5 | 32.2 | 67.2 | NA | .1 | -- | NA | .5 | 67.8 | 100.0 | NA |
| Pyrite, gross weight | 2.2 | -- | 2.2 | 31.1 | 42.0 | 5.0 | 8.0 | 10.7 | 1.0 | 97.8 | 47.1 | 52.9 |
| Salt | 34.3 | 3.3 | 37.6 | 24.5 | 14.3 | 1.1 | 7.4 | 12.0 | 3.1 | 62.4 | 73.7 | 26.3 |
| Strontium minerals [8] | 85.9 | .5 | 86.4 | 11.0 | NA | 1.9 | .7 | NA | -- | 13.6 | 100.0 | NA |
| Sulfur: | | | | | | | | | | | | |
| Native (including Frasch) | 57.4 | .7 | 58.1 | 1.0 | 36.0 | -- | 4.2 | .7 | -- | 41.9 | 63.3 | 36.7 |
| Byproduct | 50.5 | .8 | 51.3 | 20.7 | 10.5 | 1.1 | 13.7 | .5 | 2.2 | 48.7 | 89.0 | 11.0 |
| Talc and related materials | 22.6 | 2.7 | 25.3 | 17.8 | 8.9 | .5 | 41.3 | 4.9 | 1.3 | 74.7 | 86.2 | 13.8 |
| Vermiculite [8] | 61.6 | 1.4 | 63.0 | -- | NA | 36.5 | .5 | NA | -- | 37.0 | 100.0 | NA |

| MINERAL FUELS AND RELATED MATERIALS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal: | | | | | | | | | | | | |
| Anthracite and bituminous | 24.5 | .4 | 24.9 | 10.7 | 31.3 | 2.9 | 5.7 | 21.6 | 2.9 | 75.1 | 47.1 | 52.9 |
| Lignite | 2.1 | -- | 2.1 | 21.9 | 71.2 | -- | 1.1 | .3 | 3.4 | 97.9 | 28.5 | 71.5 |
| Coke: | | | | | | | | | | | | |
| Metallurgical | 17.1 | .9 | 18.0 | 24.4 | 31.4 | 1.2 | 15.4 | 8.2 | 1.4 | 82.0 | 60.4 | 39.6 |
| Other types | -- | .3 | .3 | 10.6 | 41.7 | .8 | 46.4 | -- | .2 | 99.7 | 58.3 | 41.7 |
| Fuel briquets | -- | -- | -- | 15.3 | 69.5 | .7 | 13.3 | -- | 1.3 | 100.0 | 30.5 | 69.5 |
| Gas, natural, marketed | 53.5 | 2.1 | 55.6 | 12.4 | 23.2 | 1.2 | 4.6 | 2.6 | .4 | 44.4 | 74.2 | 25.8 |
| Peat | .5 | -- | .5 | 3.6 | 95.9 | -- | -- | -- | -- | 99.5 | 4.1 | 95.9 |
| Petroleum, crude | 20.0 | 7.2 | 27.2 | .6 | 17.1 | 9.8 | 42.3 | 2.3 | .7 | 72.8 | 80.6 | 19.4 |

NA No percentage calculated because production data are not available and no basis is available for formulation of reliable estimate of output level.

[1] Percentages in this table have been calculated from commodity tables prepared for Volume I of the 1974 Minerals Yearbook, and as such may differ slightly from percentages that might be prepared using data from the country chapters in Volume III of the 1974 Minerals Yearbook.

[2] Includes Caribbean Islands.

[3] Austria, Belgium, Denmark, Finland, France, West Germany, Greece, Greenland, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and Yugoslavia.

[4] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the U.S.S.R.

[5] Afghanistan, Bahrain, Bangladesh, Brunei, Burma, Cyprus, Hong Kong, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Khmer, Republic of Korea (South Korea), Kuwait, Laos, Lebanon, Malaysia, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore, Sri Lanka, Syria, Taiwan, Thailand, Turkey, United Arab Emirates, South Vietnam, Yemen Republic, and People's Republic of Yemen.

[6] People's Republic of China, North Korea, Mongolia, and North Vietnam.

[7] Percentages calculated from a total with no figure included for the United States because U.S. data are withheld to avoid disclosing individual company confidential information.

[8] Percentages calculated from a total including no estimates for production by any centrally planned economy countries.

[9] Percentages calculated from a total including no estimates for production by centrally planned economy countries of Asia.

[10] Production negligible (less than 0.05% of total world output).

## Table 4.—Geographic distribution of world crude mineral production value by country

| Country | Value of production [1] (million 1973 U.S. dollars) | | | Country's share of total [2] (percent) | | | Country's rank among world producers [3] | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1950 | 1968 | 1973 | 1950 | 1968 | 1973 | 1950 | 1968 | 1973 |
| United States [4] | 18,144.6 | 25,836.5 | 29,877.0 | 39.31 | 26.04 | 18.77 | 1 | 1 | 1 |
| U.S.S.R | 5,276.1 | 17,969.6 | 28,088.2 | 11.43 | 18.11 | 17.64 | 2 | 2 | 2 |
| Saudi Arabia [5] | 620.6 | 2,544.3 | 9,055.1 | 1.34 | 2.56 | 5.69 | 13 | 8 | 3 |
| China, People's Republic of | 517.9 | 4,167.0 | 7,855.4 | 1.13 | 4.20 | 4.93 | 16 | 4 | 4 |
| Iran | 730.6 | 2,199.0 | 7,211.3 | 1.58 | 2.22 | 4.53 | 10 | 11 | 5 |
| Canada | 1,252.0 | 4,595.8 | 7,099.1 | 2.71 | 4.63 | 4.46 | 6 | 3 | 6 |
| Venezuela | 2,322.4 | 3,979.5 | 5,023.1 | 5.03 | 4.01 | 3.16 | 4 | 5 | 7 |
| Germany, West | 2,313.0 | 3,166.1 | 4,878.8 | 5.01 | 3.19 | 3.06 | 5 | 6 | 8 |
| Libya | -- | 2,543.8 | 4,274.3 | -- | 2.56 | 2.68 | -- | 9 | 9 |
| South Africa, Republic of | 958.3 | 2,331.5 | 4,104.7 | 2.08 | 2.35 | 2.58 | 9 | 10 | 10 |
| Nigeria | 33.9 | 184.4 | 3,638.9 | .07 | .19 | 2.29 | 53 | 52 | 11 |
| Kuwait [5] | 332.6 | 2,029.0 | 3,577.7 | .72 | 2.04 | 2.25 | 19 | 12 | 12 |
| United Kingdom | 2,685.3 | 2,647.7 | 2,810.5 | 5.82 | 2.67 | 1.77 | 3 | 7 | 13 |
| Australia | 497.6 | 1,125.3 | 2,747.4 | 1.08 | 1.13 | 1.73 | 17 | 17 | 14 |
| Poland | 999.2 | 1,619.0 | 2,633.1 | 2.17 | 1.63 | 1.65 | 8 | 13 | 15 |
| Indonesia | 326.2 | 726.6 | 2,466.5 | .71 | .73 | 1.55 | 20 | 24 | 16 |
| Iraq | 148.9 | 1,214.7 | 2,345.3 | .32 | 1.22 | 1.47 | 32 | 15 | 17 |
| Algeria | 38.1 | 1,026.2 | 2,257.8 | .08 | 1.03 | 1.42 | 51 | 20 | 18 |
| Abu Dhabi | -- | 436.4 | 1,663.9 | -- | .44 | 1.05 | -- | 29 | 19 |
| Netherlands | 190.9 | 283.2 | 1,499.8 | .41 | .29 | .94 | 27 | 39 | 20 |
| Mexico | 628.2 | 1,051.0 | 1,456.5 | 1.36 | 1.06 | .91 | 12 | 19 | 21 |
| France | 1,157.6 | 1,408.1 | 1,379.7 | 2.51 | 1.42 | .87 | 7 | 14 | 22 |
| Chile | 442.4 | 1,081.9 | 1,303.2 | .96 | 1.09 | .82 | 18 | 18 | 23 |
| Germany, East | 290.0 | 1,008.7 | 1,194.2 | .63 | 1.02 | .75 | 22 | 21 | 24 |
| Zambia | 224.9 | 865.8 | 1,036.8 | .49 | .87 | .65 | 25 | 23 | 25 |
| India | 589.9 | 866.1 | 1,013.4 | 1.28 | .87 | .64 | 15 | 22 | 26 |
| Romania | 144.9 | 568.3 | 938.4 | .32 | .57 | .59 | 33 | 27 | 27 |
| Brazil | 77.9 | 430.1 | 926.9 | .17 | .43 | .58 | 44 | 30 | 28 |
| Zaire | 253.2 | 543.7 | 866.9 | .55 | .55 | .54 | 23 | 28 | 29 |
| Peru | 162.3 | 634.2 | 788.4 | .35 | .64 | .50 | 30 | 25 | 30 |
| Czechoslovakia | 296.5 | 569.8 | 737.2 | .64 | .57 | .46 | 21 | 26 | 31 |
| Qatar | 38.2 | 310.2 | 735.7 | .08 | .31 | .46 | 50 | 37 | 32 |
| Japan | 594.7 | 1,128.4 | 716.1 | 1.29 | 1.14 | .45 | 14 | 16 | 33 |
| Argentina | 115.1 | 409.7 | 710.9 | .25 | .41 | .45 | 36 | 31 | 34 |
| Korea, North | 18.8 | 367.1 | 691.1 | .04 | .37 | .43 | 63 | 34 | 35 |
| Yugoslavia | 136.4 | 347.9 | 598.1 | .30 | .35 | .38 | 34 | 35 | 36 |
| Spain | 245.2 | 397.7 | 482.9 | .53 | .40 | .30 | 24 | 32 | 37 |
| Philippines | 44.6 | 205.2 | 405.7 | .10 | .21 | .25 | 49 | 47 | 38 |
| Oman | -- | 249.0 | 397.4 | -- | .25 | .25 | -- | 42 | 39 |
| Sweden | 187.8 | 290.9 | 391.4 | .41 | .29 | .25 | 28 | 38 | 40 |
| All others [6] | 3,117.3 | 5,871.0 | 9,322.6 | 6.74 | 5.94 | 5.85 | XX | XX | XX |
| Total | 46,154.1 | 99,230.4 | 159,201.4 | 100.00 | 100.00 | 100.00 | XX | XX | XX |

XX Not applicable.

[1] Values are as reported in source except that the value assigned therein for Puerto Rico has been added to that for the United States, and the value assigned therein for the Kuwait-Saudi Arabia Partitioned Zone has been equally divided between Kuwait and Saudi Arabia.

[2] Percentages are as reported in source except for inclusion of Puerto Rico with the United States and division of the Kuwait-Saudi Arabia Partitioned Zone's share between Kuwait and Saudi Arabia. Some percentages differ slightly from percentages calculated from corresponding value data in this table due to rounding of value data.

[3] Rankings are as reported in source except that the Kuwait-Saudi Arabia Partitioned Zone, ranked in the source as 36th in 1973 and 1968 (no production in 1950), has been omitted and all lower ranked countries have been advanced by one number. (Puerto Rico ranked below 40th, and as such did not influence rankings listed separately.)

[4] Includes Puerto Rico.

[5] Includes allowance for Kuwait-Saudi Arabia Partitioned Zone.

[6] Values and percentages derived by difference between sum of figures for individually listed countries above and listed totals; for this reason percentages given may not be calculable from listed values.

Source: Annales des Mines, No. 12, December 1975, pp. 28–29.

## Table 5.—Commodity distribution of world crude mineral production value

| Commodity | Value of production (million 1973 U.S. dollars) | | | Commodity's share of total [1] (percent) | | | Commodity's rank among listed commodities | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1950 | 1968 | 1973 | 1950 | 1968 | 1973 | 1950 | 1968 | 1973 |
| Petroleum | 15,603.0 | 40,088.0 | 75,625.0 | 33.81 | 40.40 | 47.50 | 2 | 1 | 1 |
| Coal, anthracite and bituminous | 17,454.3 | 20,836.3 | 28,991.4 | 37.82 | 21.00 | 18.21 | 1 | 2 | 2 |
| Natural gas | 838.2 | 6,452.9 | 11,152.7 | 1.82 | 6.50 | 7.01 | 6 | 3 | 3 |
| Copper | 1,760.1 | 6,340.8 | 10,039.8 | 3.81 | 6.39 | 6.31 | 4 | 4 | 4 |
| Iron | 2,127.5 | 5,874.7 | 7,055.8 | 4.61 | 5.92 | 4.43 | 3 | 5 | 5 |
| Gold | 1,751.9 | 2,067.1 | 4,181.7 | 3.80 | 2.08 | 2.63 | 5 | 7 | 6 |
| Coal, lignite | 637.6 | 2,455.8 | 3,125.4 | 1.38 | 2.47 | 1.96 | 10 | 6 | 7 |
| Natural gas liquids | 744.8 | 1,885.4 | 3,078.2 | 1.61 | 1.90 | 1.93 | 7 | 8 | 8 |
| Zinc | 674.5 | 898.0 | 1,538.0 | 1.46 | .90 | .97 | 9 | 11 | 9 |
| Nickel | 158.0 | 844.0 | 1,289.0 | .34 | .85 | .81 | 20 | 13 | 10 |
| Lead | 710.0 | 807.2 | 1,168.0 | 1.54 | .81 | .73 | 8 | 14 | 11 |
| Salt | 324.8 | 936.2 | 1,150.4 | .71 | .94 | .72 | 13 | 9 | 12 |
| Potash | 278.3 | 712.0 | 1,117.6 | .60 | .72 | .70 | 14 | 18 | 13 |
| Diamond | 158.5 | 715.1 | 1,080.0 | .34 | .72 | .68 | 19 | 17 | 14 |
| Tin | 574.4 | 737.5 | 905.2 | 1.24 | .74 | .57 | 11 | 16 | 15 |
| Phosphates | 280.0 | 881.1 | 868.8 | .50 | .89 | .55 | 16 | 12 | 16 |
| Silver | 233.4 | 754.2 | 777.2 | .51 | .76 | .49 | 15 | 15 | 17 |
| Asbestos | 176.3 | 491.0 | 579.6 | .38 | .49 | .36 | 18 | 21 | 18 |
| Platinum | 58.2 | 499.6 | 577.1 | .13 | .50 | .36 | 28 | 20 | 19 |
| Bauxite | 93.2 | 477.5 | 558.1 | .20 | .48 | .35 | 24 | 22 | 20 |
| Uranium | -- | 629.9 | 519.0 | -- | .63 | .33 | -- | 19 | 21 |
| Sulfur | 191.2 | 898.1 | 475.2 | .41 | .91 | .30 | 17 | 10 | 22 |
| Manganese | 351.8 | 448.1 | 423.7 | .76 | .45 | .27 | 12 | 23 | 23 |
| Kaolin | 103.1 | 309.0 | 377.4 | .22 | .31 | .24 | 22 | 24 | 24 |
| Molybdenum | 52.0 | 297.5 | 299.5 | .11 | .30 | .19 | 31 | 25 | 25 |
| Fluorspar | 57.7 | 118.5 | 235.4 | .13 | .12 | .15 | 29 | 31 | 26 |
| Pyrite | 75.4 | 290.5 | 221.1 | .16 | .29 | .14 | 26 | 26 | 27 |
| Tungsten | 80.4 | 210.8 | 201.0 | .17 | .21 | .13 | 25 | 27 | 28 |
| Talc | 41.9 | 122.6 | 154.6 | .09 | .12 | .10 | 32 | 30 | 29 |
| Chromite | 93.4 | 100.2 | 149.8 | .20 | .10 | .09 | 23 | 32 | 30 |
| Borates | 29.3 | 126.8 | 144.6 | .06 | .13 | .09 | 36 | 29 | 31 |
| Vanadium | 2.8 | 57.3 | 129.3 | .01 | .06 | .08 | 48 | 38 | 32 |
| Carbonate | 17.0 | 58.4 | 103.9 | .04 | .06 | .06 | 41 | 37 | 33 |
| Magnesite | 30.2 | 76.0 | 96.9 | .07 | .08 | .06 | 34 | 33 | 34 |
| Bentonite | 41.2 | 69.7 | 86.5 | .09 | .07 | .05 | 33 | 34 | 35 |
| Barite | 29.8 | 64.9 | 84.3 | .06 | .07 | .05 | 35 | 35 | 36 |
| Antimony | 55.0 | 40.0 | 78.6 | .12 | .04 | .05 | 30 | 41 | 37 |
| Ilmenite | 20.6 | 64.5 | 78.5 | .04 | .07 | .05 | 38 | 36 | 38 |
| Cobalt | 23.6 | 47.5 | 70.8 | .05 | .05 | .04 | 37 | 40 | 39 |
| Mercury | 19.5 | 157.6 | 65.2 | .04 | .16 | .04 | 39 | 28 | 40 |
| Rutile | 4.3 | 32.0 | 57.0 | .01 | .03 | .04 | 46 | 44 | 41 |
| Mica | 67.5 | 53.0 | 54.4 | .15 | .05 | .03 | 27 | 39 | 42 |
| Feldspar | 8.7 | 30.8 | 47.0 | .02 | .03 | .03 | 44 | 45 | 43 |
| Columbite-tantalite | -- | 19.0 | 40.9 | -- | .02 | .03 | -- | 49 | 44 |
| Nitrates (natural only) | 114.5 | 28.6 | 39.6 | .25 | .03 | .02 | 21 | 46 | 45 |
| Sodium sulfate | 13.8 | 35.1 | 31.1 | .03 | .04 | .02 | 43 | 42 | 46 |
| Zircon | 2.5 | 19.2 | 27.6 | .01 | .02 | .02 | 49 | 48 | 47 |
| Graphite | 14.0 | 20.4 | 23.4 | .03 | .02 | .01 | 42 | 47 | 48 |
| Asphalt (natural only) | 17.7 | 34.1 | 14.1 | .04 | .03 | .01 | 40 | 43 | 49 |
| Kyanite | -- | 9.2 | 12.0 | -- | .01 | .01 | -- | 50 | 50 |
| Cryolite | 5.0 | 4.3 | -- | .01 | (2) | -- | 45 | 51 | 51 |
| Beryl | 3.4 | 2.4 | NA | .01 | (2) | NA | 47 | 52 | 52 |
| Total | 46,154.3 | 99,230.4 | [3]159,201.4 | 100.00 | [3]100.00 | 100.00 | XX | XX | XX |

NA Not available. XX Not applicable.

[1] Percentages as reported in source; some differ slightly from percentages calculated from corresponding value data in this table due to rounding of value data.

[2] Less than ½ unit.

[3] Detail does not add to total because of rounding.

Source: Annales des Mines, No. 12, December 1975, p. 14.

## Table 6.—Value of world export trade in major mineral commodity groups [1]

(Million U.S. dollars)

| Commodity group [1] | 1969 [r] | 1970 [r] | 1971 [r] | 1972 [r] | 1973 |
|---|---|---|---|---|---|
| Metals: | | | | | |
| All ores, concentrates, scrap | 6,360 | 8,110 | 7,120 | 7,730 | 11,220 |
| Iron and steel | 13,710 | 17,070 | 17,760 | 20,080 | 28,510 |
| Nonferrous metals | 11,180 | 12,200 | 10,410 | 11,700 | 16,940 |
| Subtotal | 31,250 | 37,380 | 35,290 | 39,510 | 56,670 |
| Nonmetals (crude only) | 2,270 | 2,380 | 2,820 | 3,190 | 4,160 |
| Mineral fuels | 24,480 | 28,290 | 36,520 | 44,060 | 63,100 |
| Total | 58,000 | 68,050 | 74,630 | 86,760 | 123,930 |
| All commodities | 271,910 | 311,990 | 348,980 | 415,330 | 572,650 |

[r] Revised.

[1] Data presented are for selected major commodity groups of the Standard International Trade Classification—Revised (SITC—R), and as such exclude some mineral commodities classified in that data array together with other (nonmineral) commodities. SITC—R categories included are as follows: Ores, concentrates, and scrap—SITC Division 28; iron and steel—SITC Division 67; nonferrous metals—SITC Division 68; nonmetals (crude only)—SITC Division 27; mineral fuels—SITC Division 3. Major items not included are the metals, metalloids, and metal oxides of SITC Group 513; mineral tar and crude chemicals from coal, petroleum, and natural gas of SITC Division 52; manufactured fertilizers of SITC Division 56; and nonmetallic mineral manufactures of SITC Groups 661, 662, 663, and 667.

Source: United Nations. Monthly Bulletin of Statistics. V. XXIX, July 1975, No. 7, pp. xxiv–xli.

## Table 7.—Distribution of total value of export trade in major mineral commodity groups by group [1]

(Percent)

| Commodity group [1] | 1969 | 1970 | 1971 | 1972 | 1973 |
|---|---|---|---|---|---|
| Metals: | | | | | |
| All ores, concentrates, scrap | 11.0 | 11.9 | 9.5 | 8.9 | 9.0 |
| Iron and steel | 23.6 | 25.1 | 23.8 | 23.1 | 23.0 |
| Nonferrous metals | 19.3 | 17.9 | 14.0 | 13.5 | 13.7 |
| Total | 53.9 | 54.9 | 47.3 | 45.5 | 45.7 |
| Nonmetals (crude only) | 3.9 | 3.5 | 3.8 | 3.7 | 3.4 |
| Minerals fuels | 42.2 | 41.6 | 48.9 | 50.8 | 50.9 |
| Grand total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

[1] For detailed definition of groups, see footnote 1, table 6.

## Table 8.—Growth of value of export trade in major mineral commodity groups, by group [1]

(Percent increase over previous year)

| Commodity group [1] | 1969 | 1970 | 1971 | 1972 | 1973 |
|---|---|---|---|---|---|
| Metals: | | | | | |
| All ores, concentrates, scrap | 13.8 | 27.5 | −12.2 | 8.6 | 45.2 |
| Iron and steel | 20.1 | 24.5 | 4.0 | 13.1 | 42.0 |
| Nonferrous metals | 18.4 | 9.1 | −14.7 | 12.4 | 44.8 |
| All metals | 18.2 | 19.6 | −5.6 | 12.0 | 43.4 |
| Nonmetals (crude only) | 4.6 | 4.9 | 18.5 | 13.1 | 30.4 |
| Mineral fuels | 6.3 | 15.6 | 29.1 | 20.7 | 43.2 |
| All major mineral commodity groups | 12.3 | 17.3 | 9.7 | 16.3 | 42.8 |
| All commodity groups | 14.1 | 14.7 | 11.9 | 19.0 | 37.9 |

[1] For detailed definition of groups, see footnote 1, table 6.

## Table 9.—Significance of trade in major mineral commodity groups [1] to total trade of various world areas in 1973

| Area and country [2] | Value, million U.S. dollars | | | | Major mineral share of total commodities (percent) | |
|---|---|---|---|---|---|---|
| | Major mineral commodity groups | | All commodities | | | |
| | Exports from | Exports to | Exports from | Exports to | Exports from | Exports to |
| Northern North America: | | | | | | |
| Canada | 7,020 | 2,810 | 25,210 | 21,450 | 27.9 | 13.1 |
| United States | 5,500 | 17,820 | 70,250 | 69,960 | 7.8 | 25.5 |
| Total | 12,520 | 20,630 | 95,460 | 91,410 | 13.1 | 22.6 |
| Latin America | [3] 11,460 | 6,420 | 29,060 | 30,280 | [4] 39.4 | 21.2 |
| Europe: | | | | | | |
| Market economy countries: | | | | | | |
| EEC | 30,230 | 46,780 | 210,200 | 204,580 | 14.4 | 22.9 |
| EFTA | 4,595 | 7,955 | 37,480 | 43,320 | 12.3 | 18.4 |
| Other | 1,655 | 3,715 | 9,710 | 18,540 | 17.0 | 20.0 |
| Subtotal | 36,480 | 58,450 | 257,390 | 266,440 | 14.2 | 22.0 |
| Centrally planned economy countries | 11,780 | 9,325 | 52,250 | 49,930 | 22.6 | 18.7 |
| Total | 48,260 | 67,775 | 309,640 | 316,670 | 15.6 | 21.4 |
| Africa: | | | | | | |
| Republic of South Africa | [5] 280 | 657 | 3,540 | 4,940 | [4] 7.9 | 13.3 |
| Other | [6] 11,870 | 2,298 | 20,360 | 20,210 | [4] 58.3 | 11.4 |
| Total | 12,150 | 2,955 | 23,900 | 25,150 | 50.8 | 11.8 |
| Near East | [7] 23,150 | 2,267 | 27,030 | 15,000 | [4] 85.7 | 15.1 |
| Far East and South Asia: | | | | | | |
| Market economy countries: | | | | | | |
| Japan | [8] 5,712 | 13,170 | 36,930 | 34,460 | [4] 15.5 | 38.2 |
| Other | [3] 5,005 | 6,240 | 31,300 | 35,290 | [4] 16.0 | 17.7 |
| Subtotal | 10,717 | 19,410 | 68,230 | 69,750 | 15.7 | 27.8 |
| Centrally planned economy countries | 520 | 1,430 | 4,920 | 5,640 | 10.6 | 25.4 |
| Total | 11,237 | 20,840 | 73,150 | 75,390 | 15.4 | 27.6 |
| Australia and New Zealand | [3] 2,525 | 1,078 | 11,870 | 8,490 | [4] 21.3 | 12.7 |
| Not reported | 2,628 | 1,965 | 2,540 | 10,260 | 21.0 | 19.2 |
| Grand total | 123,930 | 123,930 | 572,650 | 572,650 | 21.6 | 21.6 |

[1] For detailed definition of groups, see footnote 1, table 6.

[2] Regional groupings generally conform to United Nations practice; modifications and special aspects of classification scheme are as follows: (1) Latin America includes Mexico, Central America, and South America, but excludes Caribbean Islands; (2) EEC consists of Belgium, Denmark, France, West Germany, Ireland, Italy, Luxembourg, the Netherlands, and the United Kingdom; (3) EFTA consists of Austria, Finland, Iceland, Norway, Portugal, Sweden and Switzerland; (4) Other market economy Europe consists of Greece and Spain as well as Yugoslavia (a centrally planned economy country); (5) centrally planned Europe includes Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the U.S.S.R.; (6) Other Africa corresponds to the United Nations category "Developing Africa"; (7) Near East corresponds to the United Nations category "Developing Asia, Middle East"; (8) Other market economy South Asia and Far East refers to the United Nations category "Developing Asia, Other"; (9) centrally planned Far East and South Asia consists of the People's Republic of China, North Korea, Mongolia, and North Vietnam; (10) the category "Not reported" is derived by subtracting all listed figures from reported totals, and includes the Caribbean and Pacific Islands.

[3] Partial figure; value of crude nonmetals excluded but presumably included under "Not reported."

[4] Percentage based on partial figure; see footnote to entry in "Exports from" value column.

[5] Partial figure; includes value of mineral fuels and crude nonmetals only; totals for other commodity groups presumably included under "Not reported."

[6] Partial figure; value of iron and steel excluded, but presumably included under "Not reported."

[7] Partial figure; includes value of mineral fuels only; totals for other commodity groups presumably included under "Not reported."

[8] Partial figure; value of metal ores, concentrates, and scrap as well as crude nonmetals excluded but presumably included under "Not reported."

Source: United Nations Monthly Bulletin of Statistics. V. XXIX, Nos. 4 and 7, New York, 1975, pp. xxii–xli and pp. xxiv–xli.

Table 10.—Export origins and destinations for major mineral commodity group[1] shipments, by value, in 1972
(Million U.S. dollars)

| Area and country[2] | Exports from | | | | | Exports to | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Metal ores, concentrates, scrap | Iron and steel | Nonferrous metals | Nonmetals | Mineral fuels | Metal ores, concentrates, scrap | Iron and steel | Nonferrous metals | Nonmetals | Mineral fuels |
| Northern North America: | | | | | | | | | | |
| Canada | 1,990 | 490 | 1,660 | 410 | 2,470 | 180 | 740 | 320 | 100 | 1,470 |
| United States | 1,080 | 1,300 | 1,060 | 390 | 1,670 | 1,290 | 2,970 | 2,480 | 420 | 10,660 |
| Total[3] | 3,070 | 1,790 | 2,720 | 800 | 4,140 | 1,470 | 3,710 | 2,800 | 520 | 12,130 |
| Latin America | 1,870 | 340 | 1,270 | (4) | 7,980 | 170 | 1,810 | 560 | 120 | 3,760 |
| Europe: | | | | | | | | | | |
| Market economy countries: | | | | | | | | | | |
| EEC | 1,310 | 14,090 | 5,360 | 910 | 8,560 | 3,920 | 9,670 | 8,130 | 1,600 | 23,460 |
| EFTA | 620 | 1,970 | 1,460 | 135 | 410 | 475 | 2,310 | 1,080 | 260 | 3,830 |
| Other[3] | 80 | 620 | 400 | 85 | 470 | 355 | 940 | 410 | 90 | 1,920 |
| Subtotal | 2,010 | 16,680 | 7,220 | 1,130 | 9,440 | 4,750 | 12,920 | 9,620 | 1,950 | 29,210 |
| Centrally planned economy countries | 990 | 3,100 | 1,550 | 540 | 5,600 | 1,040 | 3,860 | 1,030 | 465 | 2,930 |
| Total[3] | 3,000 | 19,780 | 8,770 | 1,670 | 15,040 | 5,790 | 16,780 | 10,650 | 2,415 | 32,140 |
| Africa: | | | | | | | | | | |
| Republic of South Africa | (4) | (4) | (4) | 155 | 125 | 9 | 180 | 32 | 16 | 420 |
| | 690 | (4) | 1,920 | 360 | 8,900 | 31 | 1,020 | 170 | 67 | 1,010 |
| Total[3] | 690 | (4) | 1,920 | 515 | 9,025 | 40 | 1,200 | 202 | 83 | 1,430 |
| Near East | (4) | (4) | (4) | (4) | 23,150 | 26 | 1,140 | 180 | 61 | 860 |
| Far East and South Asia: | | | | | | | | | | |
| Market economy countries: | | | | | | | | | | |
| Japan | (4) | 5,310 | 310 | (4) | 92 | 3,070 | 205 | 1,460 | 335 | 8,100 |
| Other | 740 | 465 | 790 | (4) | 3,010 | 290 | 2,150 | 600 | 220 | 2,980 |
| Subtotal[3] | 740 | 5,775 | 1,100 | (4) | 3,102 | 3,360 | 2,355 | 2,060 | 555 | 11,080 |
| Centrally planned economy countries | 70 | 130 | 140 | 120 | 60 | 70 | 930 | 290 | 20 | 120 |
| Total[3] | 810 | 5,905 | 1,240 | 120 | 3,162 | 3,430 | 3,285 | 2,350 | 575 | 11,200 |
| Australia and New Zealand | 1,090 | 275 | 560 | (4) | 600 | 58 | 365 | 105 | 100 | 450 |
| Not reported[3] | 690 | 420 | 460 | 1,055 | 3 | 236 | 220 | 93 | 286 | 1,180 |
| Grand total | 11,220 | 28,510 | 16,940 | 4,160 | 63,100 | 11,220 | 28,510 | 16,940 | 4,160 | 63,100 |

[1] For detailed definitions of groups, see footnote 1, table 6.
[2] For detailed definitions of areas listed, see footnote 2, table 9.
[3] Not reported in source but derived from data therein.
[4] Not reported separately for this area; presumably included under "Not reported."

Source: United Nations Monthly Bulletin of Statistics. V. XXIX, Nos. 4 and 7, New York, 1975, pp. xxii–xli and xxiv–xli.

## Table 11.—Direction of trade in major mineral commodities [1] in 1973

(Million U.S. dollars)

| Source [2] | Destination [2] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Northern North America | | | Latin America | Market economy Europe | | | | Centrally planned economy Europe | Near East |
| | United States | Canada | Total [3] | | EEC | EFTA | Other [3] | Total | | |
| Northern North America: | | | | | | | | | | |
| Canada | 4,210 | XX | 4,210 | 116 | 1,131 | 205 | 41 | 1,377 | 10 | 26 |
| United States | XX | 1,196 | 1,196 | 899 | 1,265 | 112 | 168 | 1,545 | 36 | 80 |
| Total [3] | 4,210 | 1,196 | 5,405 | 1,015 | 2,396 | 317 | 209 | 2,922 | 46 | 106 |
| Latin America [4] | 6,240 | 723 | 6,963 | 1,582 | 1,563 | 216 | 157 | 1,936 | 206 | 10 |
| Europe: | | | | | | | | | | |
| Market economy countries: | | | | | | | | | | |
| EEC | 1,979 | 178 | 2,157 | 606 | 17,670 | 3,747 | 1,053 | 22,470 | 1,632 | 590 |
| EFTA | 256 | 65 | 321 | 90 | 2,629 | 880 | 141 | 3,650 | 282 | 38 |
| Other [3] | 198 | 16 | 214 | 37 | 811 | 108 | 21 | 940 | 230 | 105 |
| Subtotal | 2,433 | 259 | 2,692 | 733 | 21,110 | 4,735 | 1,215 | 27,060 | 2,144 | 733 |
| Centrally planned economy countries | 195 | 16 | 211 | 269 | 2,490 | 1,201 | 549 | 4,240 | 5,930 | 146 |
| Total [3] | 2,628 | 275 | 2,903 | 1,002 | 23,600 | 5,936 | 1,764 | 31,300 | 8,074 | 879 |
| Africa: | | | | | | | | | | |
| Republic of South Africa [5] | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Other [6] | 1,488 | 160 | 1,648 | 735 | 7,285 | 375 | 500 | 8,160 | 262 | 9 |
| Total | 1,488 | 160 | 1,648 | 735 | 7,285 | 375 | 500 | 8,160 | 262 | 9 |
| Near East [7] | 950 | 285 | 1,235 | 1,280 | 9,650 | 880 | 900 | 11,430 | 185 | 700 |
| Far East and South Asia: | | | | | | | | | | |
| Market: | | | | | | | | | | |
| Japan [8] | 1,068 | 117 | 1,185 | 627 | 379 | 121 | 127 | 627 | 209 | 398 |
| Other [4] | 681 | 23 | 704 | 111 | 389 | 20 | 24 | 433 | 80 | 52 |
| Subtotal | 1,749 | 140 | 1,889 | 738 | 768 | 141 | 151 | 1,060 | 289 | 450 |
| Centrally planned economy countries | 2 | 4 | 6 | 6 | 95 | 10 | (9) | 100 | 170 | 2 |
| Total [3] | 1,751 | 144 | 1,895 | 744 | 863 | 151 | 146 | 1,160 | 459 | 452 |
| Australia and New Zealand [4] | 90 | 1 | 91 | 20 | 390 | 20 | 22 | 432 | 2 | 9 |
| Not reported [3] | 463 | 26 | 489 | 42 | 1,033 | 60 | 17 | 1,110 | 91 | 102 |
| Grand total [10] | 17,820 | 2,810 | 20,630 | 6,420 | 46,780 | 7,955 | 3,715 | 58,450 | 9,325 | 2,267 |

See footnotes at end of table.

## Table 11.—Direction of trade in major mineral commodities [1] in 1973—Continued

(Million U.S. dollars)

| Source [2] | Destination [2] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Africa | | | Market economy Far East and South Asia | | | Centrally planned economy Far East and South Asia | Australia and New Zealand | Not reported [3] | Grand total [10] |
| | Republic of South Africa | Other | Total [3] | Japan | Other | Total [3] | | | | |
| Northern North America: | | | | | | | | | | |
| Canada | 6 | 9 | 15 | 890 | 86 | 976 | 116 | 44 | 130 | 7,020 |
| United States | 32 | 60 | 92 | 1,137 | 290 | 1,427 | 31 | 56 | 138 | 5,500 |
| Total [3] | 38 | 69 | 107 | 2,027 | 376 | 2,403 | 147 | 100 | 268 | 12,520 |
| Latin America [4] | 3 | 50 | 53 | 576 | 211 | 787 | -- | 3 | (11) | 11,460 |
| Europe: | | | | | | | | | | |
| Market economy countries: | | | | | | | | | | |
| EEC | 127 | 906 | 1,033 | 149 | 324 | 473 | 372 | 85 | 812 | 30,230 |
| EFTA | 7 | 37 | 44 | 54 | 30 | 84 | 47 | 15 | 24 | 4,595 |
| Other [3] | 4 | 52 | 56 | 13 | 5 | 18 | 19 | 1 | 35 | 1,655 |
| Subtotal | 138 | 995 | 1,133 | 216 | 359 | 575 | 438 | 101 | 871 | 36,480 |
| Centrally planned economy countries | -- | 163 | 163 | 409 | 119 | 528 | 215 | 2 | 76 | 11,780 |
| Total [3] | 138 | 1,158 | 1,296 | 625 | 478 | 1,103 | 653 | 103 | 947 | 48,260 |
| Africa: | | | | | | | | | | |
| Republic of South Africa [5] | NA | NA | NA | NA | NA | NA | NA | NA | 280 | 280 |
| Other [6] | 12 | 280 | 292 | 617 | 76 | 693 | 42 | 3 | 26 | 11,870 |
| Total [3] | 12 | 280 | 292 | 617 | 76 | 693 | 42 | 3 | 306 | 12,150 |
| Near East [7] | 385 | 410 | 795 | 4,940 | 2,060 | 7,000 | 5 | 320 | 200 | 23,150 |
| Far East and South Asia: | | | | | | | | | | |
| Market economy countries: | | | | | | | | | | |
| Japan [8] | 70 | 176 | 246 | XX | 1,614 | 1,614 | 559 | 225 | 22 | 5,712 |
| Other [4] | 4 | 44 | 48 | 2,393 | 1,051 | 3,444 | 12 | 73 | 48 | 5,005 |
| Subtotal [3] | 74 | 220 | 294 | 2,393 | 2,665 | 5,058 | 571 | 298 | 70 | 10,717 |
| Centrally planned economy countries | -- | 16 | 16 | 125 | 59 | 184 | 20 | 2 | 14 | 520 |
| Total [3] | 74 | 236 | 310 | 2,518 | 2,724 | 5,242 | 591 | 300 | 84 | 11,237 |
| Australia and New Zealand [4] | 6 | 3 | 9 | 1,299 | 205 | 1,504 | 28 | 136 | 294 | 2,525 |
| Not reported [3] | 1 | 92 | 93 | 568 | 110 | 678 | (12) | 113 | (13) | 2,628 |
| Grand total [10] | 657 | 2,298 | 2,955 | 13,170 | 6,240 | 19,410 | 1,430 | 1,078 | 1,965 | 123,930 |

NA Not available. XX Not applicable.

[1] For detailed listing of commodities included, see footnote 1, table 6. It should be noted that certain commodities excluded for specific areas as indicated by footnotes are presumably included in grand totals.

[2] For detailed definitions of areas listed see footnote 2, table 9.

[3] Not reported in source. Data represents the difference between reported total detail. In selected cases the reported detail exceeds the reported total.

[4] Excludes crude nonmetals.

[5] Includes crude nonmetals and mineral fuels only.

[6] Excludes iron and steel.

[7] Includes mineral fuels only.

[8] Excludes crude nonmetals and metal ores and scrap.

[9] Summation of detail exceeds reported total by 5 million. Reason for discrepancy is unknown.

[10] As reported in source. Detail may not add to listed total.

[11] Summation of detail exceeds reported total by 80 million. Reason for discrepancy is unknown.

[12] Summation of detail exceeds reported total by 36 million. Reason for discrepancy is unknown.

[13] Summation of detail exceeds reported total by 54 million. Reason for discrepancy is unknown.

Source: United Nations Monthly Bulletin of Statistics. V. XXIX, Nos. 4 and 7, New York, 1975, pp. xxii–xli and pp. xxiv–xli.

## Table 12.—Iron ore consumption,[1] by selected major country

(Million metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| European Economic Community: | | | |
| Belgium | 20.2 | 20.4 | 21.7 |
| France [2] | 44.9 | 46.4 | 50.8 |
| Germany, West | 44.1 | 51.0 | 55.7 |
| Italy | 11.7 | 11.5 | e 18.7 |
| Luxembourg | 14.4 | 14.5 | 15.1 |
| Netherlands | 6.3 | 6.8 | 7.0 |
| United Kingdom [3] | 26.1 | 28.5 | 22.2 |
| Total | 167.7 | 179.1 | 191.2 |
| European Free Trade Association: | | | |
| Austria | 5.6 | 6.1 | e 7.0 |
| Norway | 1.1 | 1.2 | e 1.3 |
| Portugal | r e .4 | e .5 | e .4 |
| Sweden | r 9.6 | 10.3 | 5.1 |
| Total | r 16.7 | 18.1 | 13.8 |
| Other European market economies: | | | |
| Finland | 1.6 | 1.6 | e 2.1 |
| Spain | r 10.0 | 10.3 | e 10.9 |
| Total | r 11.6 | 11.9 | 13.0 |
| Centrally planned economy countries of Europe: | | | |
| Czechoslovakia e | 14.4 | r 14.0 | 15.4 |
| Hungary | 3.6 | 3.9 | 4.4 |
| Poland [4] | 11.4 | 10.5 | 11.2 |
| Romania e | 1.4 | 9.5 | 10.0 |
| U.S.S.R.e | 164.5 | 171.0 | 177.2 |
| Yugoslavia | r 3.3 | 3.5 | 4.0 |
| Total | r 198.6 | 212.4 | 222.2 |
| Other: | | | |
| Canada e | r 12.5 | r 14.6 | 14.6 |
| Japan | 98.6 | 120.3 | 122.5 |
| Turkey | 2.2 | 2.9 | NA |
| United States | 121.8 | 139.0 | 140.4 |
| Total | 235.1 | 276.8 | 277.5 |
| Grand total | r 629.7 | 698.3 | 717.7 |

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Yearly data based on a total of three categories: Iron ore for steelworks, for agglomerates, and iron ore and concentrate for blast furnaces. An estimated figure is based on a partial total of these three categories or is an apparent consumption computed by adding production and imports and then deducting exports.

[2] Includes sinter produced at mines.

[3] Includes calcined ores.

[4] Includes 422,000 metric tons of contained metal for steelworks in 1972, 211,000 metric tons in 1973, and 208,000 metric tons in 1974.

Source: United Nations Economic Commission for Europe, Annual Bulletin of Steel Statistics for Europe, 1974. V. II, New York, 1975, and official production and trade statistics for selected countries.

## Table 13.—Iron and steel scrap consumption, by selected major country

(Thousand metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| European Economic Community: | | | |
| Belgium [1 2] | 4,360 | 4,590 | 4,925 |
| France [2 3] | r 8,560 | 9,448 | 9,380 |
| Germany, West [3] | 22,713 | 24,984 | 25,578 |
| Italy [2] | 12,378 | 13,238 | e 14,000 |
| Luxembourg | 1,634 | 1,773 | 1,903 |
| Netherlands | 2,242 | 2,040 | 2,125 |
| United Kingdom [1 3] | 18,691 | 14,484 | 16,955 |
| Total | r 70,578 | 70,557 | 74,866 |
| European Free Trade Association: | | | |
| Austria [2 3] | 1,575 | 1,585 | e 1,600 |
| Denmark [2 4] | 506 | 420 | 523 |
| Norway [1 2 3] | 490 | 508 | e 500 |
| Portugal [1 2 3] | e 132 | NA | NA |
| Sweden [1 2] | 3,285 | 3,561 | 3,520 |
| Total | 5,988 | 6,074 | 6,143 |
| Other market economies: | | | |
| Finland | 717 | 742 | e 750 |
| Spain [3 5] | 5,848 | 6,518 | e 7,000 |
| Total | 6,565 | 7,260 | e 7,750 |
| Centrally planned economy countries of Europe: | | | |
| Czechoslovakia [1 2 3] | 5,981 | 5,593 | 6,918 |
| Hungary [1 3] | 2,052 | 2,044 | 2,076 |
| Poland [5] | 7,318 | 7,863 | 8,237 |
| Romania [1 3 5] | 2,830 | 2,704 | e 2,700 |
| U.S.S.R. e [1 2 3] | 44,947 | 46,257 | 46,862 |
| Yugoslavia [1 3] | 1,535 | 1,729 | 1,629 |
| Total | 64,663 | 66,190 | 68,422 |
| Other: | | | |
| Canada [1 2 3] | 5,487 | 6,923 | 7,114 |
| Japan [3] | 39,668 | 48,651 | 46,246 |
| Turkey [1 3 6] | 440 | NA | NA |
| United States [1] | r 86,418 | 93,965 | 95,708 |
| Total | r 132,013 | 149,539 | 149,068 |
| Grand total | r 279,807 | 299,620 | 306,249 |

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Excludes scrap consumption by rerollers.

[2] Excludes scrap consumption by iron foundries.

[3] Excludes scrap consumption by industry other than iron and steel.

[4] Production of pig iron, which consumed 37,300 metric tons in 1972, was discontinued at the close of 1972.

[5] Excludes scrap consumption in steelworks.

[6] Excludes scrap consumption in blast furnaces.

Source: United Nations Economic Commission for Europe. Annual Bulletin of Steel Statistics for Europe, 1974. V. II, No. 2, New York, 1975.

## Table 14.—Estimated world [1] consumption of major nonferrous metals

| Commodity | | 1972 r | 1973 r | 1974 p |
|---|---|---|---|---|
| Aluminum [2] | thousand metric tons | 12,036 | 13,308 | 13,648 |
| Copper [3] | do | 7,956 | 8,676 | 8,130 |
| Lead [4] | do | 3,962 | 4,214 | 4,058 |
| Zinc [5] | do | 5,199 | 5,650 | 5,341 |
| Tin [6] | thousand long tons | 188 | 209 | 197 |

p Preliminary. r Revised.

[1] In general, figures are totals for major consuming countries only; sum of consumption by excluding minor consumers may be significant; data included for centrally planned economy countries (except Yugoslavia) are listed as conjectural in source.

[2] Apparently includes secondary metal.

[3] Primary and secondary refined metal.

[4] Chiefly primary, but including some secondary.

[5] Primary and secondary slab.

[6] Primary only as reported by the International Tin Council. Centrally planned economy countries (except Yugoslavia) are excluded; consumption of primary and secondary tin by these countries is estimated at about 60,000 long tons annually.

Source: American Bureau of Metal Statistics, Inc. Non-ferrous Metal Data, 1974. New York, 1975, 143 pp.

## Table 15.—World energy consumption,[1] by energy source

(Million metric tons of standard coal equivalent unless otherwise specified)

| Area [2] and year | Solid fuels | Liquid fuels | Natural and imported gas | Hydro, nuclear, imported electricity | Total energy | |
|---|---|---|---|---|---|---|
| | | | | | Aggregate [1] | Per capita (kilograms) |
| **Market economy:** | | | | | | |
| North America: | | | | | | |
| 1969 | 490 | 1,003 | 811 | 51 | 2,355 | 10,520 |
| 1970 | 498 | 1,044 | 852 | 53 | 2,444 | 10,799 |
| 1971 | 476 | 1,084 | 884 | 58 | 2,502 | 10,939 |
| 1972 | 492 | 1,168 | 902 | 64 | 2,625 | 11,374 |
| 1973 | 524 | 1,226 | 899 | 70 | 2,719 | 11,686 |
| 1974 | 521 | 1,182 | 873 | 79 | 2,655 | 11,321 |
| Other America: | | | | | | |
| 1969 | 8 | 83 | 11 | 6 | 107 | 697 |
| 1970 | 8 | 86 | 12 | 7 | 113 | 719 |
| 1971 | 8 | 93 | 14 | 7 | 122 | 760 |
| 1972 | 7 | 98 | 16 | 8 | 129 | 784 |
| 1973 | 7 | 109 | 17 | 9 | 143 | 844 |
| 1974 | 8 | 111 | 18 | 11 | 147 | 848 |
| Caribbean America: | | | | | | |
| 1969 | 7 | 81 | 27 | 3 | 117 | 997 |
| 1970 | 7 | 91 | 30 | 4 | 131 | 1,070 |
| 1971 | 7 | 99 | 32 | 4 | 142 | 1,118 |
| 1972 | 8 | 103 | 33 | 4 | 148 | 1,139 |
| 1973 | 9 | 109 | 37 | 4 | 159 | 1,187 |
| 1974 | 9 | 120 | 39 | 5 | 172 | 1,246 |
| Western Europe: | | | | | | |
| 1969 | 463 | 682 | 80 | 45 | 1,270 | 3,601 |
| 1970 | 449 | 772 | 107 | 47 | 1,375 | 3,882 |
| 1971 | 419 | 807 | 139 | 48 | 1,413 | 3,964 |
| 1972 | 380 | 855 | 178 | 52 | 1,464 | 4,077 |
| 1973 | 392 | 918 | 203 | 53 | 1,567 | 4,336 |
| 1974 | 375 | 876 | 233 | 58 | 1,542 | 4,243 |
| Africa: | | | | | | |
| 1969 | 57 | 40 | 2 | 3 | 102 | 297 |
| 1970 | 59 | 45 | 2 | 3 | 109 | 309 |
| 1971 | 63 | 52 | 2 | 3 | 121 | 334 |
| 1972 | 63 | 55 | 3 | 4 | 125 | 337 |
| 1973 | 67 | 57 | 4 | 4 | 130 | 347 |
| 1974 | 71 | 60 | 5 | 4 | 140 | 359 |
| Near East: | | | | | | |
| 1969 | 6 | 45 | 17 | 1 | 69 | 683 |
| 1970 | 7 | 49 | 28 | 1 | 84 | 801 |
| 1971 | 7 | 54 | 28 | 1 | 90 | 835 |
| 1972 | 7 | 60 | 30 | 1 | 98 | 890 |
| 1973 | 7 | 67 | 34 | 1 | 110 | 966 |
| 1974 | 8 | 73 | 37 | 1 | 119 | 1,023 |
| Far East: | | | | | | |
| 1969 | 175 | 293 | 13 | 15 | 496 | 450 |
| 1970 | 180 | 344 | 16 | 16 | 556 | 494 |
| 1971 | 172 | 379 | 17 | 17 | 585 | 510 |
| 1972 | 170 | 407 | 20 | 18 | 614 | 524 |
| 1973 | 178 | 454 | 26 | 17 | 675 | 563 |
| 1974 | 192 | 435 | 31 | 18 | 677 | 552 |
| Oceania: | | | | | | |
| 1969 | 35 | 37 | -- | 3 | 74 | 3,962 |
| 1970 | 35 | 39 | 2 | 3 | 79 | 4,064 |
| 1971 | 35 | 41 | 3 | 3 | 82 | 4,165 |
| 1972 | 36 | 42 | 5 | 3 | 86 | 4,281 |
| 1973 | 37 | 46 | 6 | 3 | 93 | 4,572 |
| 1974 | 39 | 45 | 7 | 4 | 94 | 4,544 |
| Total market economy: | | | | | | |
| 1969 | 1,241 | 2,262 | 960 | 126 | 4,589 | 1,905 |
| 1970 | 1,238 | 2,468 | 1,050 | 132 | 4,890 | 1,985 |
| 1971 | 1,187 | 2,608 | 1,119 | 141 | 5,057 | 2,018 |
| 1972 | 1,163 | 2,788 | 1,185 | 153 | 5,290 | 2,068 |
| 1973 | 1,222 | 2,987 | 1,227 | 162 | 5,597 | 2,144 |
| 1974 | 1,223 | 2,902 | 1,243 | 179 | 5,547 | 2,082 |
| **Centrally planned economy:** | | | | | | |
| Europe: [3] | | | | | | |
| 1969 | 762 | 403 | 287 | 16 | 1,468 | 4,250 |
| 1970 | 768 | 437 | 316 | 17 | 1,538 | 4,421 |
| 1971 | 786 | 468 | 346 | 18 | 1,616 | 4,607 |
| 1972 | 808 | 508 | 366 | 18 | 1,700 | 4,802 |

See footnotes at end of table.

## Table 15.—World energy consumption,[1] by energy source—Continued

(Million metric tons of standard coal equivalent unless otherwise specified)

| Area[2] and year | Solid fuels | Liquid fuels | Natural and imported gas | Hydro, nuclear, imported electricity | Total energy | |
|---|---|---|---|---|---|---|
| | | | | | Aggregate[1] | Per capita (kilograms) |
| Centrally planned economy—Continued | | | | | | |
| Europe[3]—Continued | | | | | | |
| 1973 | 815 | 553 | 392 | 18 | 1,778 | 4,983 |
| 1974 | 821 | 589 | 422 | 20 | 1,851 | 5,139 |
| Asia:[4] | | | | | | |
| 1969 | 352 | 23 | 2 | 5 | 381 | 487 |
| 1970 | 411 | 31 | 2 | 5 | 449 | 565 |
| 1971 | 423 | 38 | 3 | 6 | 470 | 580 |
| 1972 | 435 | 44 | 3 | 6 | 488 | 592 |
| 1973 | 466 | 58 | 4 | 6 | 534 | 639 |
| 1974 | 487 | 76 | 4 | 6 | 573 | 675 |
| Total centrally planned economy: | | | | | | |
| 1969 | 1,113 | 426 | 289 | 20 | 1,849 | 1,640 |
| 1970 | 1,180 | 468 | 318 | 22 | 1,987 | 1,738 |
| 1971 | 1,209 | 506 | 349 | 23 | 2,086 | 1,798 |
| 1972 | 1,243 | 551 | 370 | 24 | 2,187 | 1,857 |
| 1973 | 1,281 | 611 | 396 | 24 | 2,312 | 1,940 |
| 1974 | 1,308 | 665 | 425 | 26 | 2,424 | 2,004 |
| World total: | | | | | | |
| 1969 | 2,354 | 2,688 | 1,249 | 146 | 6,438 | 1,819 |
| 1970 | 2,418 | 2,936 | 1,368 | 154 | 6,877 | 1,908 |
| 1971 | 2,396 | 3,114 | 1,468 | 164 | 7,143 | 1,947 |
| 1972 | 2,406 | 3,339 | 1,555 | 177 | 7,477 | 2,001 |
| 1973 | 2,503 | 3,598 | 1,623 | 186 | 7,909 | 2,080 |
| 1974 | 2,531 | 3,567 | 1,668 | 205 | 7,971 | 2,059 |

[1] In most cases data are aggregates of country figures representing apparent inland consumption—the arithmetic result of adding production and imports and subtracting from this sum the total of exports, bunker loadings, and additions to stocks (where the latter are known). All totals in this table are reported in source and may not represent the sum of listed parts due to rounding and/or omission from detail of minor quantities not listed separately. A large number of entries in this table have been revised from those appearing in previous editions of this chapter due to revisions published in new edition of source; such revisions have not been identified by footnotes.

[2] Areas listed are those appearing in source and have not been conformed in scope to standard terms used elsewhere in the Minerals Yearbook.

[3] Includes Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the U.S.S.R.

[4] Includes People's Republic of China, North Vietnam, Mongolia, and North Korea.

Source: United Nations. World Energy Supplies 1950–74. Statistical Papers, Series J, No. 19, New York, 1976, pp. 2–9.

## Table 16.—Annual investment expenditure in the steel industry for selected countries

(Million dollars)

| Country or country group | 1972 | 1973 p |
|---|---|---|
| European Economic Community (EEC) | 3,206 | 3,038 |
| European Free Trade Association (EFTA)[1] | 406 | 438 |
| Other countries: | | |
| Australia | 216 | 131 |
| Canada | 209 | 215 |
| Finland | 23 | 34 |
| Japan[2] | 2,396 | 2,071 |
| Spain | 229 | 239 |
| Turkey | 59 | -- |
| United States | 1,164 | 1,596 |

p Preliminary.

[1] Totals given exclude expenditures in Switzerland.

[2] Japanese fiscal years.

Source: Organization for Economic Cooperation and Development. The Iron and Steel Industry in 1973 and Trends in 1974, p. 71.

## Table 17.—Market economy country petroleum capital expenditures and exploration expenses, by geographic area

(Million dollars)

| | 1972 | 1973 | 1974 |
|---|---|---|---|
| United States: | | | |
| Capital expenditures | 9,050 | 10,640 | 16,625 |
| Exploration expenses | 740 | 850 | 1,130 |
| Total | 9,790 | 11,490 | 17,755 |
| Other Western Hemisphere: | | | |
| Capital expenditures | 3,120 | 3,305 | 4,945 |
| Exploration expenses | 250 | 275 | 405 |
| Total | 3,370 | 3,580 | 5,350 |
| Western Europe: | | | |
| Capital expenditures | 4,450 | 4,825 | 6,920 |
| Exploration expenses | 125 | 175 | 225 |
| Total | 4,575 | 5,000 | 7,145 |
| Africa: | | | |
| Capital expenditures | 1,005 | 975 | 1,215 |
| Exploration expenses | 175 | 125 | 150 |
| Total | 1,180 | 1,100 | 1,365 |
| Near East: | | | |
| Capital expenditures | 975 | 1,390 | 1,770 |
| Exploration expenses | 50 | 50 | 50 |
| Total | 1,025 | 1,440 | 1,820 |
| Far East: | | | |
| Capital expenditures | 2,700 | 2,410 | 3,525 |
| Exploration expenses | 200 | 225 | 225 |
| Total | 2,900 | 2,635 | 3,750 |
| Unspecified: Capital expenditures (no exploration expenses) | 3,650 | 6,450 | 8,700 |
| Total: | | | |
| Capital expenditures | 24,950 | 29,995 | 43,700 |
| Exploration expenses | 1,540 | 1,700 | 2,185 |
| Grand total | 26,490 | 31,695 | 45,885 |

Source: Energy Division, Chase Manhattan Bank, N.A. Capital Investments of the World Petroleum Industry, 1974, pp. 20–23.

## Table 18.—Market economy country petroleum industry capital expenditures, by industry sector and exploration expenses

(Million dollars)

| | 1972 | 1973 | 1974 |
|---|---|---|---|
| Capital expenditures: | | | |
| Production: | | | |
| Crude oil and natural gas | 9,590 | 12,415 | 18,765 |
| Natural gasoline plants | 515 | 510 | 770 |
| Pipelines | 1,230 | 1,230 | 2,460 |
| Marine | 3,775 | 6,550 | 8,900 |
| Refineries | 4,955 | 4,865 | 7,720 |
| Marketing | 2,825 | 2,480 | 2,215 |
| Chemical plants | 1,350 | 1,175 | 1,995 |
| Other | 710 | 770 | 875 |
| Total | 24,950 | 29,995 | 43,700 |
| Exploration expenses | 1,540 | 1,700 | 2,185 |
| Grand total | 26,490 | 31,695 | 45,885 |

Source: Energy Division, Chase Manhattan Bank, N.A. Capital Investments of the World Petroleum Industry, 1974, pp. 18–19.

## Table 19.—U.S. direct foreign investment in mineral industries: Value, earnings, and income

(Million dollars)

| Area and country | Mining, smelting, and refining | | | Petroleum | | |
|---|---|---|---|---|---|---|
| | Value | Earnings [1] | Income [2] | Value | Earnings [1] | Income [2] |
| 1971 | 6,685 | 499 | 482 | 24,152 | r 2,946 | r 2,532 |
| 1972 | 7,110 | 419 | 395 | 26,263 | 3,311 | 2,826 |
| 1973: | | | | | | |
| Canada | 2,666 | 197 | 134 | 5,320 | 659 | 196 |
| Latin American and other Western Hemisphere: | | | | | | |
| Latin American Republics: | | | | | | |
| Chile | NA | ([3]) | 1 | NA | 3 | ([3]) |
| Peru | 466 | NA | NA | 149 | −21 | NA |
| Venezuela | NA | NA | NA | NA | 470 | 484 |
| Other | 728 | -- | 127 | 2,013 | 171 | 60 |
| Subtotal [4] | 1,194 | 146 | 128 | 2,162 | 623 | 544 |
| Other Western Hemisphere | 488 | 92 | 96 | 882 | 190 | 105 |
| Total | 1,682 | 238 | 224 | 3,044 | 813 | 649 |
| Europe: | | | | | | |
| European Economic Community: | | | | | | |
| Denmark and Ireland | 1 | ([3]) | ([3]) | 352 | NA | NA |
| United Kingdom | NA | −1 | −1 | 2,457 | 123 | 68 |
| Other [5] | NA | ([3]) | ([3]) | 4,575 | 442 | 156 |
| Subtotal [4] | NA | −1 | −1 | 7,384 | 565 | 224 |
| Other Western Europe | NA | 3 | 2 | 1,140 | 113 | −8 |
| Total | 56 | 2 | 1 | 8,524 | 678 | 216 |
| Africa: | | | | | | |
| South Africa, Republic of | NA | 33 | 20 | NA | NA | NA |
| Other | 408 | 32 | NA | 1,589 | 596 | 421 |
| Total [4] | 408 | 65 | 20 | 1,589 | 596 | 421 |
| Near East | 3 | -- | -- | 2,139 | 2,157 | 2,065 |
| Far East and Pacific: | | | | | | |
| Japan | -- | -- | -- | 868 | 102 | 13 |
| Australia | 844 | 95 | 75 | 842 | 125 | 84 |
| New Zealand | NA | ([3]) | ([3]) | NA | NA | NA |
| Other | 172 | 20 | NA | 1,665 | 611 | 460 |
| Total [4] | 1,016 | 115 | 75 | 3,375 | 838 | 557 |
| International shipping | -- | -- | -- | 2,967 | 326 | 155 |
| Grand total [6] | 6,038 | 617 | 497 | 27,313 | 6,128 | 4,249 |
| 1974: p | | | | | | |
| Canada | 2,793 | 197 | 122 | 5,716 | 772 | 248 |
| Latin American and other Western Hemisphere: | | | | | | |
| Latin American Republics: | | | | | | |
| Chile | 343 | −1 | 4 | NA | NA | -- |
| Peru | 411 | 45 | 51 | 239 | −46 | −44 |
| Venezuela | 21 | NA | NA | 659 | 332 | 333 |
| Other | 262 | 131 | 110 | 1,138 | 270 | 177 |
| Subtotal [4] | 1,037 | 175 | 161 | 2,036 | 556 | 466 |
| Other Western Hemisphere | 402 | 96 | 102 | 1,521 | 206 | 207 |
| Total | 1,439 | 271 | 263 | 3,557 | 762 | 673 |
| Europe: | | | | | | |
| European Economic Community: | | | | | | |
| Denmark and Ireland | 2 | ([3]) | ([3]) | 504 | 20 | −26 |
| United Kingdom | NA | ([3]) | ([3]) | 2,915 | 36 | −47 |
| Other [5] | NA | −2 | ([3]) | 4,847 | 574 | 420 |
| Subtotal [4] | NA | −2 | ([3]) | 8,266 | 630 | 347 |
| Other Western Europe | NA | −7 | −7 | 1,727 | 149 | 20 |
| Total | 47 | −9 | −7 | 9,993 | 779 | 367 |

See footnotes at end of table.

## Table 19.—U.S. direct foreign investment in mineral industries: Value, earnings, and income—Continued

(Million dollars)

| Area and country | Mining, smelting, and refining | | | Petroleum | | |
|---|---|---|---|---|---|---|
| | Value | Earnings [1] | Income [2] | Value | Earnings [1] | Income [2] |
| 1974 [p]—Continued | | | | | | |
| Africa: | | | | | | |
| South Africa, Republic of | NA | 37 | 28 | NA | NA | NA |
| Other | 442 | NA | NA | 1,340 | 915 | 743 |
| Total [4] | 442 | 37 | 28 | 1,340 | 915 | 743 |
| Near East | 3 | -- | -- | 1,618 | 8,455 | 8,434 |
| Far East and Pacific: | | | | | | |
| Japan | -- | -- | -- | 1,368 | 88 | 23 |
| Australia | 960 | 194 | 129 | 782 | 99 | NA |
| New Zealand | NA | 1 | 1 | NA | NA | [3] |
| Other | 216 | NA | NA | 1,746 | 1,160 | 862 |
| Total [4] | 1,176 | 195 | 130 | 3,896 | 1,347 | 885 |
| International shipping | -- | -- | -- | 3,635 | 387 | 210 |
| Grand total [6] | 6,124 | 794 | 636 | 30,248 | 13,513 | 11,699 |

[r] Revised. NA Not available.
[1] Sum of U.S. share in net earnings of subsidiary and branch profits.
[2] Sum of interest, dividends, and branch earnings.
[3] Less than ½ unit.
[4] Partial figure; excludes quantity for detail indicated as not available.
[5] Includes Belgium, Luxembourg, France, Germany, Italy, and the Netherlands.
[6] Detail may not add to totals shown because of independent rounding and exclusion of some data in detail.

Source: U.S. Department of Commerce, Survey of Current Business. V. 55, No. 10, October 1975, pp. 52–63.

## Table 20.—World merchant fleet distribution, by type [1]

| | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|
| Number of vessels: | | | | | |
| Tankers | 4,232 | 4,431 | 4,581 | 4,813 | 5,121 |
| Bulk carriers | 2,954 | 3,218 | 3,539 | 3,800 | 4,075 |
| Freighters | 10,998 | 11,095 | 11,087 | 11,170 | 11,449 |
| Other | 1,796 | 1,800 | 1,802 | 1,817 | 1,804 |
| Total | 19,980 | 20,544 | 21,009 | 21,600 | 22,449 |
| Gross tonnage: | | | | | |
| Tankers thousand tons | 88,896 | 99,105 | 108,558 | 122,370 | 143,399 |
| Bulk carriers do | 47,199 | 55,009 | 64,822 | 74,660 | 82,313 |
| Freighters do | 63,159 | 64,038 | 65,179 | 66,790 | 68,855 |
| Other do | 12,147 | 12,150 | 11,984 | 11,907 | 11,799 |
| Total do | 211,401 | 230,302 | 250,543 | 275,727 | 306,366 |
| Deadweight tonnage: | | | | | |
| Tankers do | 153,075 | 173,196 | 192,894 | 220,481 | 261,440 |
| Bulk carriers do | 77,173 | 90,962 | 108,512 | 126,140 | 139,267 |
| Freighters do | 87,428 | 88,305 | 88,970 | 90,511 | 93,476 |
| Other do | 9,323 | 9,276 | 9,176 | 9,238 | 9,165 |
| Total do | 326,999 | 361,739 | 399,552 | 446,370 | 503,348 |

[1] Maritime Administration classification. Tankers include whaling tankers. Vessels shown here as "Other" include combination passenger and cargo, combination passenger and refrigerated cargo, and refrigerated freighters. Contribution of these vessels to mineral commodity trade is regarded as unimportant. Data are as of December 31 of year indicated.

## Table 21.—World shipping (tanker and dry cargo) loadings and unloadings
(Million metric tons)

| | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|
| Loaded: | | | | | |
| Tanker cargo | 1,440 | 1,526 | 1,654 | 1,867 | 1,838 |
| Dry cargo | 1,165 | 1,173 | 1,219 | 1.407 | 1,450 |
| Total | 2,605 | 2,699 | 2,873 | 3,274 | 3,288 |
| Unloaded: | | | | | |
| Tanker cargo | 1,403 | 1,505 | 1,640 | 1,860 | 1,810 |
| Dry cargo | 1,127 | 1,144 | 1,218 | 1,377 | 1,456 |
| Total | 2,530 | 2,649 | 2,858 | 3,237 | 3,266 |

Source: United Nations. Monthly Bulletin of Statistics. V. XXX, No. 1, January 1976, p. xxiii.

## Table 22.—World shipping of tanker cargo, by region
(Million metric tons)

| Region | Loadings | | | | | Unloadings | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1970 | 1971 | 1972 | 1973 | 1974 | 1970 | 1971 | 1972 | 1973 | 1974 |
| Developed market economies: | | | | | | | | | | |
| Australia, New Zealand | 1 | 2 | 2 | 3 | 4 | 22 | 17 | 16 | 16 | 17 |
| Canada | 1 | 2 | 5 | 7 | 7 | 15 | 18 | 24 | 25 | 22 |
| Japan | -- | 1 | 2 | 1 | 2 | 201 | 223 | 245 | 276 | 258 |
| South Africa, Republic of | -- | -- | -- | -- | -- | 12 | 16 | 14 | 15 | 15 |
| United States | 5 | 4 | 3 | 3 | -- | 162 | 174 | 206 | 275 | 270 |
| Western Europe | 100 | 98 | 111 | 122 | 116 | 705 | 737 | 787 | 855 | 828 |
| Other | 6 | 13 | 22 | 21 | 21 | 5 | 12 | 20 | 21 | 22 |
| Total | 113 | 120 | 145 | 157 | 150 | 1,122 | 1,197 | 1,312 | 1,483 | 1,432 |
| Developing market economies: | | | | | | | | | | |
| Caribbean | 63 | 63 | 60 | 73 | 73 | 89 | 100 | 99 | 114 | 116 |
| Far East | 59 | 64 | 79 | 88 | 93 | 83 | 91 | 100 | 107 | 108 |
| Near East | 659 | 762 | 855 | 1,001 | 1,007 | 13 | 12 | 15 | 16 | 18 |
| North Africa | 226 | 183 | 169 | 167 | 134 | 18 | 17 | 17 | 19 | 20 |
| Other Africa | 63 | 84 | 103 | 117 | 126 | 14 | 15 | 15 | 17 | 16 |
| Venezuela | 181 | 169 | 163 | 170 | 156 | -- | -- | -- | -- | -- |
| Other Latin America | 11 | 9 | 12 | 16 | 17 | 44 | 48 | 51 | 65 | 62 |
| Other | -- | 1 | 1 | 1 | 1 | 1 | 2 | 4 | 4 | 4 |
| Total | 1,262 | 1,335 | 1,442 | 1,633 | 1,607 | 262 | 285 | 301 | 342 | 344 |
| Centrally planned economies: | | | | | | | | | | |
| U.S.S.R | 61 | 68 | 63 | 69 | 72 | 3 | 5 | 8 | 13 | 10 |
| Other | 4 | 3 | 4 | 8 | 9 | 16 | 18 | 19 | 22 | 24 |
| Total | 65 | 71 | 67 | 77 | 81 | 19 | 23 | 27 | 35 | 34 |

Source: United Nations. Monthly Bulletin of Statistics. V. XXX, No. 1, January 1976, pp. xxiii–xxvi.

## Table 23.—World shipping of dry cargo, by region
(Million metric tons)

| Region | Loadings | | | | | Unloadings | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1970 | 1971 | 1972 | 1973 | 1974 | 1970 | 1971 | 1972 | 1973 | 1974 |
| Developed market economies: | | | | | | | | | | |
| Australia, New Zealand | 93 | 115 | 121 | 149 | 156 | 15 | 16 | 16 | 21 | 23 |
| Canada | 95 | 94 | 94 | 105 | 99 | 38 | 37 | 38 | 41 | 39 |
| Japan | 42 | 51 | 52 | 55 | 65 | 235 | 238 | 277 | 312 | 339 |
| South Africa, Republic of | 15 | 15 | 18 | 19 | 19 | 6 | 7 | 7 | 7 | 8 |
| United States | 213 | 182 | 207 | 247 | 246 | 131 | 133 | 135 | 147 | 155 |
| Western Europe | 239 | 240 | 264 | 303 | 320 | 460 | 449 | 465 | 529 | 557 |
| Other | 2 | 4 | 1 | 3 | 3 | 6 | 5 | 4 | 6 | 5 |
| Total | 699 | 701 | 757 | 881 | 908 | 891 | 885 | 942 | 1,063 | 1,126 |
| Developing market economies: | | | | | | | | | | |
| Caribbean | 32 | 29 | 27 | 29 | 31 | 13 | 13 | 14 | 15 | 14 |
| Far East | 94 | 98 | 102 | 121 | 109 | 69 | 80 | 80 | 101 | 104 |
| Near East | 9 | 9 | 12 | 13 | 12 | 19 | 24 | 23 | 28 | 30 |
| North Africa | 28 | 28 | 29 | 32 | 36 | 17 | 20 | 24 | 25 | 27 |
| Other Africa | 75 | 74 | 74 | 81 | 79 | 23 | 25 | 23 | 24 | 27 |
| Venezuela | 23 | 27 | 18 | 23 | 20 | 4 | 4 | 5 | 5 | 5 |
| Other Latin America | 105 | 109 | 102 | 129 | 143 | 32 | 32 | 35 | 38 | 49 |
| Other | -- | 9 | 6 | 8 | 10 | 3 | 3 | 2 | 2 | 3 |
| Total | 366 | 383 | 370 | 436 | 440 | 180 | 201 | 206 | 238 | 259 |
| Centrally planned economies: | | | | | | | | | | |
| U.S.S.R | 46 | 45 | 46 | 44 | 46 | 11 | 10 | 22 | 24 | 12 |
| Other | 44 | 44 | 46 | 46 | 56 | 45 | 48 | 48 | 52 | 59 |
| Total | 90 | 89 | 92 | 90 | 102 | 56 | 58 | 70 | 76 | 71 |

Source: United Nations. Monthly Bulletin of Statistics. V. XXX, No. 1, January 1976, pp. xxiii–xxvi.

## Table 24.—Distribution of world oil tanker tonnage, by size group [1]

| Size group (deadweight tons) | 1966 | | 1974 | | | |
|---|---|---|---|---|---|---|
| | | | In service | | New building in progress or on order at yearend | |
| | Million deadweight tons | Percent of total | Million deadweight tons | Percent of total | Million deadweight ton [2] | Percent of total |
| Under 25,000 [1] | 30.0 | 30.2 | 21.9 | 8.6 | 1.1 | .7 |
| 25,000–45,000 | 25.3 | 25.5 | 30.5 | 11.9 | 7.1 | 4.3 |
| 45,000–65,000 | 21.2 | 21.3 | 22.6 | 8.9 | 1.8 | 1.1 |
| 65,000–125,000 | 21.8 | 21.9 | 46.4 | 18.1 | 17.6 | 10.7 |
| 125,000–205,000 | 1.1 | 1.1 | 18.0 | 7.0 | 21.4 | 13.0 |
| 205,000–285,000 | -- | -- | 105.5 | 41.2 | 57.9 | 35.2 |
| 285,000 and over | -- | -- | 10.9 | 4.3 | 57.5 | 35.0 |
| Total | 99.4 | 100.0 | [3]255.8 | 100.0 | 164.4 | 100.0 |

[1] Includes vessels 2,000 deadweight tons and over for 1966 and 10,000 deadweight tons and over for 1974.
[2] Excludes 7.3 million deadweight tons combined carriers.
[3] Data differ slightly from total given in table 20 because of difference in source.

Source: British Petroleum Co. Ltd. BP Statistical Review of the World Oil Industry. Bayard Press, London, 1966, p. 15; 1974, p. 14.

Table 25.—Commercial ocean traffic through the Panama Canal in terms of number of transits and total cargo moved, by type of vessel

| | Tankers | Combination carriers | Container cargo ships | Dry bulk carriers | General cargo ships | Other | Total |
|---|---|---|---|---|---|---|---|
| 1973 | | | | | | | |
| Number of transits: | | | | | | | |
| In ballast: | | | | | | | |
| Atlantic to Pacific | 130 | 6 | 1 | 150 | 136 | 758 | 1,181 |
| Pacific to Atlantic | 472 | 2 | 1 | 71 | 142 | 145 | 833 |
| Total | 602 | 8 | 2 | 221 | 278 | 903 | 2,014 |
| Laden: | | | | | | | |
| Atlantic to Pacific | 785 | 54 | 331 | 1,471 | 2,640 | 620 | 5,901 |
| Pacific to Atlantic | 382 | 9 | 371 | 1,367 | 2,570 | 1,227 | 5,926 |
| Total | 1,167 | 63 | 702 | 2,838 | 5,210 | 1,847 | 11,827 |
| In ballast and laden: | | | | | | | |
| Atlantic to Pacific | 915 | 60 | 332 | 1,621 | 2,776 | 1,378 | 7,082 |
| Pacific to Atlantic | 854 | 11 | 372 | 1,438 | 2,712 | 1,372 | 6,759 |
| Grand total | 1,769 | 71 | 704 | 3,059 | 5,488 | 2,750 | 13,841 |
| Cargo moved (thousand metric tons): | | | | | | | |
| Atlantic to Pacific | 14,499 | 2,690 | 2,649 | 37,095 | 16,349 | 1,270 | 74,552 |
| Pacific to Atlantic | 9,248 | 422 | 3,376 | 22,089 | 15,493 | 2,881 | 53,509 |
| Total | 23,747 | 3,112 | 6,025 | 59,184 | 31,842 | 4,151 | 128,061 |
| 1974 | | | | | | | |
| Number of transits: | | | | | | | |
| In ballast: | | | | | | | |
| Atlantic to Pacific | 139 | -- | 5 | 40 | 56 | 651 | 891 |
| Pacific to Atlantic | 587 | -- | 8 | 212 | 233 | 127 | 1,167 |
| Total | 726 | -- | 13 | 252 | 289 | 778 | 2,058 |
| Laden: | | | | | | | |
| Atlantic to Pacific | 1,038 | -- | 463 | 1,907 | 2,174 | 694 | 6,276 |
| Pacific to Atlantic | 536 | -- | 533 | 1,321 | 1,995 | 1,314 | 5,699 |
| Total | 1,574 | -- | 996 | 3,228 | 4,169 | 2,008 | 11,975 |
| In ballast and laden: | | | | | | | |
| Atlantic to Pacific | 1,177 | -- | 468 | 1,947 | 2,230 | 1,345 | 7,167 |
| Pacific to Atlantic | 1,123 | -- | 541 | 1,533 | 2,228 | 1,441 | 6,866 |
| Grand total | 2,300 | -- | 1,009 | 3,480 | 4,458 | 2,786 | 14,033 |
| Cargo moved (thousand metric tons): | | | | | | | |
| Atlantic to Pacific | 19,812 | -- | 4,457 | 50,776 | 14,973 | 1,314 | 91,332 |
| Pacific to Atlantic | 12,959 | -- | 5,280 | 22,519 | 12,917 | 2,900 | 56,575 |
| Total | 32,771 | -- | 9,737 | 73,295 | 27,890 | 4,214 | 147,907 |

Source: Panama Canal Co. Annual Reports for 1973 and 1974.

## Table 26.—Movement of mineral commodities through the Panama Canal by commodity type and direction of movement

(Thousand metric tons)

| Commodity | Atlantic to Pacific | | | Pacific to Atlantic | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1972 | 1973 | 1974 | 1972 | 1973 | 1974 | 1972 | 1973 | 1974 |
| METALS | | | | | | | | | |
| Aluminum: | | | | | | | | | |
| Bauxite and alumina | 1,518 | 1,593 | 1,071 | 781 | 576 | 671 | 2,299 | 2,169 | 1,742 |
| Metal, except scrap | 76 | 59 | 76 | 67 | 90 | 51 | 143 | 149 | 127 |
| Chromium, chromite | 42 | 96 | 53 | 110 | 185 | 247 | 152 | 281 | 300 |
| Copper: | | | | | | | | | |
| Ore and concentrate | 28 | 46 | 36 | 252 | 557 | 669 | 280 | 603 | 705 |
| Metal, except scrap | 18 | 17 | 17 | 598 | 541 | 402 | 616 | 558 | 419 |
| Iron and steel: | | | | | | | | | |
| Iron ore | 478 | 212 | 591 | 1,830 | 2,134 | 2,384 | 2,308 | 2,346 | 2,975 |
| Pig iron, steel ingots and other crude forms, except scrap | 77 | 143 | 221 | 71 | 20 | 71 | 148 | 163 | 292 |
| Semimanufactures (excluding tinplate) | 1,499 | 1,796 | 2,085 | 7,793 | 7,993 | 6,845 | 9,292 | 9,789 | 8,930 |
| Lead: | | | | | | | | | |
| Ore and concentrate | 1 | 3 | 6 | 165 | 136 | 194 | 166 | 139 | 200 |
| Metal, except scrap | 9 | 6 | 15 | 209 | 202 | 168 | 218 | 208 | 183 |
| Manganese ore and concentrate | 184 | 203 | 172 | 142 | 116 | 146 | 326 | 319 | 318 |
| Tin: | | | | | | | | | |
| Ore and concentrate | 2 | 3 | 2 | 70 | 78 | 61 | 72 | 81 | 63 |
| Metal (including tinplate) | 110 | 122 | 135 | 109 | 134 | 107 | 219 | 256 | 242 |
| Zinc: | | | | | | | | | |
| Ore and concentrate | 168 | 255 | 262 | 347 | 530 | 726 | 515 | 785 | 988 |
| Metal, except scrap | 10 | 9 | 28 | 126 | 147 | 81 | 136 | 156 | 109 |
| Other and unclassified: | | | | | | | | | |
| Ore and concentrate | 122 | 118 | 144 | 621 | 765 | 995 | 743 | 883 | 1,137 |
| Metal, except scrap | 34 | 59 | 75 | 172 | 213 | 145 | 206 | 272 | 220 |
| Metal scrap, all metals | 1,415 | 3,286 | 3,512 | 57 | 17 | 38 | 1,472 | 3,303 | 3,550 |
| NONMETALS | | | | | | | | | |
| Asbestos | 183 | 123 | 81 | 49 | 54 | 63 | 232 | 177 | 144 |
| Borax | 12 | 4 | 7 | 392 | 457 | 444 | 404 | 461 | 451 |
| Cement | 152 | 120 | 145 | 15 | 42 | 17 | 167 | 162 | 162 |
| Clays and clay products: | | | | | | | | | |
| Fire clay and kaolin | 291 | 281 | 338 | 37 | 31 | 26 | 328 | 312 | 364 |
| Brick and tile | 75 | 64 | 75 | 176 | 149 | 98 | 251 | 213 | 173 |
| Diatomaceous earth | 14 | 9 | 6 | 30 | 48 | 33 | 44 | 57 | 39 |
| Fertilizer materials: | | | | | | | | | |
| Nitrogenous: | | | | | | | | | |
| Ammonia compounds | 400 | 368 | 568 | 13 | 28 | 50 | 413 | 396 | 618 |
| Sodium nitrate | 8 | 33 | 43 | 358 | 304 | 288 | 366 | 337 | 331 |
| Phosphatic | 4,276 | 4,655 | 5,278 | 2 | 3 | 1 | 4,278 | 4,658 | 5,279 |
| Potassic | 276 | 345 | 274 | 605 | 498 | 620 | 881 | 843 | 894 |
| Unclassified | 824 | 1,114 | 1,371 | 84 | 138 | 146 | 908 | 1,252 | 1,517 |
| Sodium compounds: | | | | | | | | | |
| Salt | 112 | 108 | 83 | 593 | 439 | 101 | 705 | 547 | 184 |
| Other | 680 | 568 | 761 | 43 | 17 | 16 | 723 | 585 | 777 |
| Sulfur | 101 | 352 | 501 | 687 | 755 | 940 | 788 | 1,107 | 1,441 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | | | | |
| Coal and coke | 14,341 | 13,864 | 18,526 | 509 | 361 | 629 | 14,850 | 14,225 | 19,155 |
| Petrochemicals | 369 | 435 | 564 | 383 | 259 | 426 | 752 | 694 | 990 |
| Petroleum: | | | | | | | | | |
| Crude | 5,172 | 4,622 | 6,218 | 1,821 | 7,159 | 10,899 | 6,993 | 11,781 | 17,117 |
| Refinery products | 8,744 | 8,461 | 12,329 | 1,961 | 3,093 | 3,033 | 10,705 | 11,554 | 15,362 |
| Total | 41,821 | 43,552 | 55,669 | 21,278 | 28,269 | 31,831 | 63,099 | 71,821 | 87,500 |

Source: Panama Canal Co. Annual Report, 1974, pp. 46–49.

## Table 27.—Indexes of ocean freight rates
(1970=100)

| Year and quarter | Trip charter | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | West Germany | Norway | | | | | | Centrally planned economy countries [1] | | |
| | | Tankers (deadweight tons) | | | | | Dry cargo | Tankers (deadweight tons) | | |
| | Tankers | 30,000 (clean) | 30,000 (dirty) | 30,000–60,000 | 60,000–150,000 | Over 150,000 | | Less than 1,100 | 2,000–3,000 | Over 8,000 |
| 1971 | 58 | -- | -- | 55 | -- | -- | 68 | 83 | 85 | 72 |
| 1972 | 41 | -- | -- | 43 | -- | -- | 62 | 108 | 87 | 73 |
| 1973: [2] | | | | | | | | | | |
| First quarter | 76 | -- | -- | 77 | -- | -- | 101 | 121 | 127 | 123 |
| Second quarter | 139 | -- | -- | 137 | -- | -- | 125 | 135 | 131 | 143 |
| Third quarter | 184 | -- | -- | 176 | -- | -- | 154 | 196 | 173 | 173 |
| Fourth quarter | 115 | -- | -- | 110 | -- | -- | 180 | 256 | 282 | 225 |
| Annual average | 116 | -- | -- | 119 | -- | -- | 135 | 164 | 158 | 162 |
| 1974: [2] | | | | | | | | | | |
| First quarter | 95 | 137 | 112 | 91 | 56 | 38 | 205 | 241 | 228 | 278 |
| Second quarter | 67 | 89 | 100 | 71 | 52 | 36 | 190 | 245 | 294 | 297 |
| Third quarter | 52 | 87 | 73 | 56 | 36 | 23 | 172 | 235 | 228 | 189 |
| Fourth quarter | 57 | 80 | 75 | 50 | 31 | 18 | 162 | 245 | 267 | 240 |
| Annual average | 75 | 106 | 90 | 68 | 44 | 30 | 182 | 245 | 246 | 250 |

| Year and quarter | Time charter | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | West Germany | Norway | United Kingdom | | | | | | | |
| | | | Tankers [3] (deadweight tons) | | | | | Dry cargo (deadweight tons) | | |
| | Dry cargo | Dry cargo | 16,500–24,999 | 25,000–44,999 | 45,000–79,999 | 80,000–160,000 | Over 160,000 | 9,000–16,000 | 20,000–40,000 | Over 40,000 |
| 1971 | -- | 89 | 95 | 97 | 111 | 109 | -- | 69 | 55 | 45 |
| 1972 | -- | 89 | 88 | 85 | 89 | 88 | -- | 69 | 57 | 48 |
| 1973: [2] | | | | | | | | | | |
| First quarter | 164 | 104 | NA | NA | NA | NA | -- | 103 | 106 | 103 |
| Second quarter | 191 | 181 | NA | NA | NA | NA | -- | 133 | 130 | 119 |
| Third quarter | 246 | 230 | NA | NA | NA | NA | -- | 149 | 155 | 161 |
| Fourth quarter | 310 | 261 | 177 | 161 | 155 | 159 | 100 | 188 | 208 | 220 |
| Annual average | 207 | 127 | 138 | 131 | 129 | 133 | 100 | 143 | 150 | 151 |
| 1974: [2] | | | | | | | | | | |
| First quarter | 286 | 250 | 169 | 155 | 135 | 128 | 91 | 207 | 185 | 147 |
| Second quarter | 256 | 222 | 162 | 150 | 133 | 118 | 90 | 222 | 300 | 150 |
| Third quarter | 221 | 251 | 138 | 136 | 122 | 110 | 86 | 211 | 169 | 100 |
| Fourth quarter | 202 | 230 | 105 | 101 | 90 | 79 | 63 | 203 | 174 | 105 |
| Annual average | 248 | 240 | 153 | 143 | 128 | 116 | 87 | 211 | 182 | 126 |

NA Not available.

[1] Includes Bulgaria, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the U.S.S.R.

[2] Quarterly figures are for the last month in the quarter except for United Kingdom dry cargo, which figures are averages for the quarter indicated.

[3] Listed in previous editions of this chapter as London Tanker Brokers Panel. Index numbers of rates are now available according to tanker size, and represent the trip/time charter of the average freight rate assessment.

Source: United Nations. Monthly Bulletin of Statistics, September 1974, p. xxxvi and June 1975, p. xxii.

## Table 28.—Nonferrous metal prices in the United States

(Average, cents per pound, unless otherwise specified)

| Year and month | Aluminum [1] | Copper [2] | Lead [3] | Zinc [4] | Tin [5] | Silver [6] |
|---|---|---|---|---|---|---|
| 1972 | 26.409 | 50.617 | 15.029 | 17.752 | 176.875 | 168.380 |
| 1973 | 25.000 | 58.865 | 16.285 | 20.658 | 227.558 | 255.339 |
| 1974: | | | | | | |
| January | 29.000 | 68.128 | 18.981 | 31.168 | 298.136 | 363.695 |
| February | 29.000 | 67.950 | 19.000 | 31.898 | 351.492 | 535.895 |
| March | 29.595 | 67.950 | 19.529 | 32.642 | 389.405 | 532.552 |
| April | 31.500 | 67.950 | 21.487 | 34.816 | 440.762 | 503.595 |
| May | 31.500 | 80.834 | 21.899 | 34.784 | 456.875 | 543.182 |
| June | 33.500 | 85.620 | 24.500 | 34.946 | 462.813 | 489.610 |
| July | 33.500 | 85.971 | 24.500 | 36.398 | 462.568 | 441.545 |
| August | 36.000 | 85.971 | 24.500 | 37.622 | 422.977 | 443.136 |
| September | 39.000 | 83.038 | 24.500 | 39.263 | 415.913 | 404.875 |
| October | 39.000 | 77.803 | 24.500 | 39.334 | 367.420 | 482.977 |
| November | 39.000 | 75.624 | 24.500 | 39.228 | 370.961 | 469.389 |
| December | 39.000 | 72.947 | 24.500 | 39.239 | 351.869 | 439.125 |
| Annual average | 34.133 | 76.649 | 22.533 | 35.945 | 399.266 | 470.798 |

[1] Unalloyed ingot, 99.5%, delivered United States.
[2] Electrolytic copper, domestic refineries, on Atlantic seaboard.
[3] Refined lead, nationwide.
[4] Prime Western slab, f.o.b., East St. Louis.
[5] Straits tin, New York.
[6] Cents per troy ounce, 999 fine, New York.

Source: American Bureau of Metal Statistics, Inc. Non-ferrous Metal Data, 1974. New York, 1975, 143 pp.

## Table 29.—Nonferrous metal prices in the United Kingdom

(Average, U.S. cents per pound, unless otherwise specified) [1]

| Year and month | Aluminum [2] | Copper [3] | Lead [4] | Zinc | Tin [5] | Silver [6] |
|---|---|---|---|---|---|---|
| 1972 | 26.603 | 48.545 | 13.678 | 17.117 | 170.899 | 168.569 |
| 1973 | 26.326 | 80.805 | 19.382 | 38.314 | 218.148 | 254.370 |
| 1974: | | | | | | |
| January | 27.49 | 92.192 | 25.623 | 60.183 | 296.314 | 360.32 |
| February | 28.12 | 103.951 | 29.414 | 68.609 | 341.809 | 560.45 |
| March | 31.27 | 124.570 | 32.124 | 73.759 | 375.030 | 535.81 |
| April | 34.29 | 137.565 | 31.799 | 78.813 | 417.264 | 500.91 |
| May | 34.65 | 130.449 | 30.286 | 80.607 | 422.407 | 536.58 |
| June | 34.31 | 110.705 | 25.829 | 63.794 | 409.737 | 482.83 |
| July | 34.31 | 87.089 | 24.826 | 49.647 | 386.719 | 435.02 |
| August | 38.46 | 81.766 | 24.888 | 48.243 | 398.377 | 443.71 |
| September | 37.98 | 66.276 | 24.412 | 41.267 | 416.295 | 404.60 |
| October | 38.25 | 63.463 | 24.332 | 37.361 | 337.055 | 478.62 |
| November | 38.13 | 64.188 | 24.171 | 35.965 | 335.925 | 467.50 |
| December | 39.10 | 58.494 | 24.209 | 34.966 | 325.699 | 441.64 |
| Annual average | 34.69 | 93.097 | 26.801 | 55.973 | 371.391 | 470.60 |

[1] London Metal Exchange, average settlement prices.
[2] Ingot, 99.5%.
[3] Electrolytic wirebar.
[4] Refined pig lead, 99.97%.
[5] Standard tin.
[6] U.S. cents per troy ounce, 999 fine.

Source: American Bureau of Metal Statistics, Inc. Non-ferrous Metal Data, 1974. New York, 1975, 143 pp.

## Table 30.—Nonferrous metal prices in Canada

(Average, U.S. cents per pound, unless otherwise specified)

| Year and month | Aluminum [1] | Copper [2] | Lead [3] | Zinc [3] | Silver [4] |
|---|---|---|---|---|---|
| 1972 | ([5]) | 51.292 | 15.572 | 18.666 | 168.401 |
| 1973 | ([5]) | 63.662 | 16.224 | 23.568 | ([6]) |
| 1974: | | | | | |
| January | ([5]) | 74.636 | 18.386 | 31.000 | 361.095 |
| February | ([5]) | 75.775 | 19.000 | 31.000 | 523.721 |
| March | ([5]) | 78.219 | 19.000 | 31.000 | 518.181 |
| April | ([5]) | 79.730 | 20.905 | 33.286 | 487.505 |
| May | ([5]) | 80.535 | 21.500 | 34.000 | 522.714 |
| June | ([5]) | 85.211 | 21.500 | 34.000 | 473.670 |
| July | ([5]) | 84.500 | 21.500 | 34.000 | 430.743 |
| August | ([5]) | 84.194 | 21.500 | 36.286 | 434.148 |
| September | ([5]) | 82.324 | 21.500 | 37.000 | 399.855 |
| October | ([5]) | 78.904 | 21.500 | 37.000 | 475.295 |
| November | ([5]) | 75.960 | 21.500 | 37.000 | 462.333 |
| December | ([5]) | 73.870 | 21.500 | 37.000 | 432.253 |
| Annual average | ([5]) | 79.487 | 20.774 | 34.381 | 460.126 |

[1] Ingot 99.5%, f.o.b., delivered basis Canadian points.
[2] Electrolytic wirebar, f.o.b., delivered Canadian points.
[3] Pig lead, Prime Western zinc; producers' prices, carload quantities, communicated by Cominco Ltd.
[4] United States cents per troy ounce, average price of Cominco Ltd.
[5] Canadian aluminum producers ceased quoting a "published" price effective May 8, 1972.
[6] No yearly average reported for 1973.

Source: American Bureau of Metal Statistics, Inc. Non-ferrous Metal Data, 1974. New York, 1975, 143 pp.

## Table 31.—Mineral commodity export price indexes

(1963=100)

| Year and quarter | Metal ores | Fuels | All crude minerals |
|---|---|---|---|
| 1972 | 134 | 143 | 141 |
| 1973 | 161 | 188 | 181 |
| 1974: | | | |
| First quarter | 213 | 537 | 462 |
| Second quarter | 231 | 548 | 476 |
| Third quarter | 212 | 561 | 483 |
| Fourth quarter | 207 | 565 | 486 |
| Annual average | 216 | 553 | 477 |

Source: United Nations. Monthly Bulletin of Statistics, New York, September 1975, p. xv.

## Table 32.—Analysis of export price indexes

(1963=100)

| Year and quarter | Developed areas | | Developing areas | |
|---|---|---|---|---|
| | Total minerals | Nonferrous base metals | Total minerals | Nonferrous base metals |
| 1972 | 154 | 150 | 135 | 161 |
| 1973 | 191 | 207 | 178 | 252 |
| 1974: | | | | |
| First quarter | 277 | 273 | 536 | 350 |
| Second quarter | 310 | 308 | 540 | 407 |
| Third quarter | 337 | 244 | 538 | 285 |
| Fourth quarter | 369 | 221 | 529 | 233 |
| Annual average | 323 | 261 | 536 | 319 |

Source: United Nations. Monthly Bulletin of Statistics, New York, September 1975, p. xv.

## Table 33.—Leading world producers of bauxite
(Gross weight, thousand metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| Australia | 14,437 | 17,596 | 20,057 |
| Jamaica | 12,543 | 13,600 | 15,328 |
| Surinam | r 7,191 | 7,110 | e 7,112 |
| Guinea | 2,050 | e 3,050 | e 6,600 |
| U.S.S.R.e 1 | 4,200 | 4,300 | 4,300 |
| Guyana | 3,344 | 3,276 | e 3,150 |
| Greece | r 2,408 | 2,749 | 3,004 |
| France | r 3,401 | 3,133 | 2,909 |
| Hungary | 2,358 | 2,600 | 2,751 |
| Yugoslavia | 2,197 | 2,167 | 2,370 |
| United States | 1,841 | 1,909 | 1,981 |
| Total | r 55,970 | 61,490 | 69,562 |
| All others | r 9,014 | 8,469 | 8,694 |
| Grand total | r 64,984 | 69,959 | 78,256 |

e Estimate. p Preliminary. r Revised.
1 Excludes nepheline concentrates and alunite ore.

## Table 34.—Leading world producers of aluminum
(Thousand metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| United States | 3,740 | 4,108 | 4,448 |
| U.S.S.R.e | 1,250 | 1,360 | 1,430 |
| Japan | 1,015 | 1,103 | 1,124 |
| Canada | r 918 | 942 | 1,007 |
| Germany, West | 445 | 533 | 689 |
| Norway | r 557 | 620 | 649 |
| France | r 392 | 359 | 395 |
| United Kingdom | 171 | 252 | 293 |
| Netherlands | 166 | 190 | 252 |
| Italy | r 149 | 184 | 223 |
| Australia | 206 | 207 | 219 |
| Spain | r 144 | 162 | 189 |
| Romania | 122 | 141 | 187 |
| Ghana | 144 | 151 | 157 |
| Total | r 9,419 | 10,312 | 11,262 |
| All others | r 1,593 | 1,843 | 1,909 |
| Grand total | r 11,012 | 12,155 | 13,171 |

e Estimate. p Preliminary. r Revised.

## Table 35.—Leading world producers of mine copper
(Copper content of ore, thousand metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| United States 1 | 1,510 | 1,558 | 1,446 |
| Chile | 717 | 735 | 902 |
| Canada 1 | 720 | 824 | 842 |
| U.S.S.R.e 1 2 | 665 | 700 | 740 |
| Zambia | 718 | 707 | 698 |
| Zaire | r 436 | 488 | 499 |
| Australia | 187 | 220 | 256 |
| Philippines | 214 | 221 | 225 |
| Peru | 219 | 219 | 223 |
| Poland | 135 | 155 | 190 |
| Papua New Guinea | 124 | 183 | 184 |
| South Africa, Republic of | 162 | 176 | 179 |
| Yugoslavia | 103 | 112 | e 123 |
| Total | r 5,910 | 6,298 | 6,507 |
| All others | r 733 | 822 | 845 |
| Grand total | r 6,643 | 7,120 | 7,352 |

e Estimate. p Preliminary. r Revised.
1 Recoverable.
2 Smelter production.

## Table 36.—Leading world producers of iron ore, iron ore concentrates, and iron ore agglomerates

(Thousand metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| U.S.S.R | r 208,128 | 216,105 | 225,000 |
| Australia | r 64,401 | 84,812 | 96,673 |
| United States | 76,645 | 89,076 | 85,709 |
| Brazil | r 46,471 | 55,019 | 71,022 |
| China, People's Republic of e | r 52,000 | r 56,000 | 56,000 |
| France | r 54,246 | 54,232 | 54,264 |
| Canada | r 39,544 | 48,891 | 49,976 |
| Sweden | r 33,979 | 34,728 | 36,955 |
| India | 35,500 | 35,400 | 34,858 |
| Venezuela | r 18,498 | 23,110 | 26,424 |
| Liberia | 22,509 | 23,542 | 23,785 |
| Mauritania | r 9,252 | 10,480 | 11,666 |
| South Africa, Republic of | 11,223 | 10,955 | 10,830 |
| Chile | 8,640 | 9,402 | 10,292 |
| Peru | 9,414 | 8,964 | 9,526 |
| Total | r 690,450 | 760,716 | 802,980 |
| All others | r 87,434 | 89,214 | 90,473 |
| Grand total | r 777,884 | 849,930 | 893,453 |

e Estimate. p Preliminary. r Revised.

## Table 37.—Leading world producers of crude steel [1]

(Thousand metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| U.S.S.R | 125,589 | 131,459 | 136,000 |
| United States | 120,874 | 136,803 | 132,195 |
| Japan | 96,900 | 119,322 | 117,131 |
| Germany, West | 43,705 | 49,521 | 53,232 |
| France | 24,054 | 25,264 | 27,023 |
| China, People's Republic of e | 23,000 | r 27,000 | 27,000 |
| Italy | 19,815 | 20,995 | 23,803 |
| United Kingdom | 25,321 | 26,649 | 22,428 |
| Belgium | 14,532 | 15,522 | 16,233 |
| Poland | 13,476 | 14,057 | 14,566 |
| Czechoslovakia | 12,727 | 13,158 | 13,868 |
| Canada | 11,860 | 13,386 | 13,623 |
| Spain | r 9,536 | 10,809 | 11,258 |
| Romania | 7,401 | 8,161 | 8,900 |
| Australia | 6,743 | 7,684 | 7,755 |
| Total | r 555,533 | 619,790 | 625,015 |
| All others | r 73,162 | 77,441 | 81,783 |
| Grand total | r 628,695 | 697,231 | 706,798 |

e Estimate. p Preliminary. r Revised.
[1] Steel ingots and castings.

## Table 38.—Leading world producers of mine lead

(Lead content of ore, thousand metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| United States [1] | 561 | 547 | 602 |
| U.S.S.R.e | 460 | 470 | 475 |
| Australia | 396 | 405 | 377 |
| Canada | r 370 | 388 | 331 |
| Mexico [1] | 161 | 179 | 218 |
| Peru [1] | 184 | 199 | 204 |
| Yugoslavia | 120 | 119 | 120 |
| Bulgaria | 102 | 105 | 108 |
| Korea, North e | 80 | 90 | 101 |
| China, People's Republic of e | 100 | 100 | 100 |
| Total | r 2,534 | 2,602 | 2,636 |
| All others | r 912 | 914 | 852 |
| Grand total | r 3,446 | 3,516 | 3,488 |

e Estimate. p Preliminary. r Revised.
[1] Recoverable.

## Table 39.—Leading world producers of manganese ore

(Gross weight, thousand metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| U.S.S.R | 7,819 | 8,245 | e 8,300 |
| South Africa, Republic of | 3,271 | 4,176 | 3,745 |
| Gabon | 1,937 | 1,919 | 2,138 |
| Brazil | 2,058 | 2,157 | e 1,800 |
| Australia | r 1,165 | 1,522 | 1,522 |
| India | 1,642 | 1,535 | 1,447 |
| China, People's Republic of e | 1,000 | 1,000 | 1,000 |
| Mexico | 296 | 364 | 403 |
| Zaire | 369 | 334 | 309 |
| Ghana | 498 | 318 | e 300 |
| Morocco | 96 | 146 | 175 |
| Total | r 20,151 | 21,716 | 21,139 |
| All others | r 670 | 574 | 553 |
| Grand total | r 20,821 | 22,290 | 21,692 |

e Estimate. p Preliminary. r Revised.

## Table 40.—Leading world producers of mine tin

(Tin content of ore, long tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| Malaysia | r 75,619 | 71,121 | 67,048 |
| Bolivia | 30,986 | 29,838 | 29,032 |
| U.S.S.R.e | 28,500 | 29,000 | 29,500 |
| Indonesia | 20,992 | 21,945 | 24,626 |
| Thailand | r 21,723 | 20,591 | 20,018 |
| China, People's Republic of e | 20,000 | 20,000 | 20,000 |
| Australia | 11,808 | 10,105 | 9,990 |
| Nigeria | r 6,625 | 5,736 | 5,369 |
| Total | r 216,253 | 208,336 | 205,583 |
| All others | r 24,078 | 24,022 | 22,059 |
| Grand total | r 240,331 | 232,358 | 227,642 |

e Estimate. p Preliminary. r Revised.

## Table 41.—Leading world producers of mine zinc

(Zinc content of ore, thousand metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| Canada | 1,129 | 1,227 | 1,159 |
| U.S.S.R.e | 650 | 670 | 680 |
| Australia | 507 | 457 | 454 |
| United States | 434 | 434 | 453 |
| Peru | 376 | 415 | 397 |
| Mexico | 272 | 271 | 263 |
| Japan | r 152 | 264 | 241 |
| Poland | r 222 | 210 | 216 |
| Yugoslavia | 97 | 97 | e 169 |
| Korea, North e | r 150 | r 160 | 162 |
| Germany, West | 122 | 123 | 116 |
| Sweden | 114 | 119 | 109 |
| China, People's Republic of e | 100 | 100 | 100 |
| Spain | 89 | 94 | 94 |
| Zaire | 100 | 88 | 90 |
| Total | r 4,514 | 4,729 | 4,703 |
| All others | r 921 | 983 | 1,092 |
| Grand total | r 5,436 | 5,712 | 5,795 |

e Estimate. p Preliminary. r Revised.

## Table 42.—Leading world producers of hydraulic cement
(Thousand metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| U.S.S.R | 104,299 | 109,500 | 115,000 |
| United States (including Puerto Rico) | 76,708 | 79,445 | 75,195 |
| Japan | r 66,292 | 78,118 | 73,112 |
| Italy | r 33,461 | 36,312 | 36,309 |
| Germany, West | 43,145 | 41,012 | 35,977 |
| France | r 29,913 | 30,713 | 32,472 |
| China, People's Republic of e | r23,000 | r 25,000 | 27,000 |
| Spain (including Canary Islands) | r 19,576 | 22,248 | 23,600 |
| United Kingdom | 18,048 | 19,986 | 17,781 |
| Poland | 13,986 | 15,548 | 16,765 |
| Brazil | 11,381 | 13,398 | 14,920 |
| India | r 15,756 | 15,006 | 14,263 |
| Romania | 9,212 | 9,848 | 11,195 |
| Mexico | 8,602 | 9,787 | 10,498 |
| Canada | 9,050 | 10,093 | 10,258 |
| Germany, East | 8,857 | 9,548 | 10,100 |
| Czechoslovakia | 8,045 | 8,381 | 8,966 |
| Turkey | 8,424 | 8,934 | 8,938 |
| Total | r 507,755 | 542,877 | 542,409 |
| All others | r 148,897 | 158,417 | 161,675 |
| Grand total | r 656,652 | 701,294 | 704,084 |

e Estimate. p Preliminary. r Revised.

## Table 43.—Leading world producers of nitrogen fertilizer compounds [1]
(Thousand metric tons of contained nitrogen)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| United States | 8,091 | 8,433 | 9,152 |
| U.S.S.R | 6,055 | 6,551 | 7,241 |
| China, People's Republic of e | r 1,650 | r 2,030 | 2,500 |
| Japan | 2,125 | 2,454 | 2,204 |
| France | 1,417 | 1,472 | 1,694 |
| Germany, West | 1,321 | 1,471 | 1,473 |
| Poland | 1,081 | 1,147 | 1,366 |
| Netherlands | 1,038 | 1,189 | 1,263 |
| Italy | 1,034 | 1,046 | 1,124 |
| India | 946 | 1,054 | 1,050 |
| United Kingdom | 772 | 751 | 984 |
| Total | r 25,530 | 27,598 | 30,051 |
| All others | r 9,498 | 10,325 | 10,801 |
| Grand total | r 35,028 | 37,923 | 40,852 |

e Estimate. p Preliminary. r Revised.
[1] Years ending June 30 of that stated.

## Table 44.—Leading world producers of phosphate rock [1]
(Thousand metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| United States | 37,042 | 38,226 | 41,446 |
| U.S.S.R.e [2] | r 19,722 | 21,250 | 22,540 |
| Morocco | r 15,105 | 17,077 | 19,721 |
| Tunisia | 3,387 | 3,473 | 3,823 |
| China, People's Republic of e | r 2,600 | r 3,000 | 3,000 |
| Togo | 1,928 | 2,292 | 2,572 |
| Total | r 79,784 | 85,318 | 93,102 |
| All others | r 10,247 | 13,463 | 17,279 |
| Grand total | r 90,031 | 98,781 | 110,381 |

e Estimate. p Preliminary. r Revised.
[1] Includes output of all major crude mineral sources of phosphate.
[2] Includes material described as sedimentary rock in Soviet sources.

## Table 45.—Leading world producers of marketable potash
(Thousand metric tons $K_2O$ equivalent)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| U.S.S.R | 5,433 | 5,900 | e 6,078 |
| Canada | 3,495 | 4,454 | 5,508 |
| Germany, East | 2,458 | 2,556 | 2,865 |
| Germany, West | r 2,448 | 2,548 | 2,620 |
| United States | 2,412 | 2,361 | 2,315 |
| France | r 1,761 | 2,263 | 2,275 |
| Total | r 18,007 | 20,082 | 21,661 |
| All others | r 2,005 | 1,960 | 2,007 |
| Grand total | e r 20,012 | 22,042 | 23,668 |

e Estimate. p Preliminary. r Revised.

## Table 46.—Leading world producers of pyrite
(Gross weight, thousand metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| U.S.S.R. e | r 7,600 | r 8,200 | 8,500 |
| Spain | 2,140 | 2,401 | 2,600 |
| China, People's Republic of e | 2,000 | 2,000 | 2,000 |
| Japan | r 1,580 | 1,275 | 1,286 |
| Italy | 1,382 | 1,169 | e 1,168 |
| Romania e | 840 | 870 | 870 |
| Finland | 857 | 777 | 722 |
| Norway | r 804 | 792 | 665 |
| South Africa, Republic of | 439 | 551 | 511 |
| Portugal | 553 | 532 | 511 |
| Morocco | 430 | 407 | 509 |
| Korea, North e | 500 | 500 | 500 |
| Greece | 403 | 430 | 500 |
| Sweden | 486 | 450 | e 450 |
| Total | r 20,014 | 20,354 | 20,792 |
| All others | r 2,842 | 2,560 | 2,848 |
| Grand total | r 22,856 | 22,914 | 23,640 |

e Estimate. p Preliminary. r Revised.

## Table 47.—Leading world producers of salt
(Thousand metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| United States (including Puerto Rico) | 40,869 | 39,862 | 42,114 |
| China, People's Republic of e | 18,000 | 18,000 | 18,000 |
| U.S.S.R | 12,200 | 12,200 | e 12,500 |
| Germany, West | r 8,462 | 10,201 | e 10,984 |
| United Kingdom | r e 8,898 | 8,394 | e 8,400 |
| India | r 6,518 | 6,861 | e 6,341 |
| France | r 5,237 | r e 5,783 | 5,996 |
| Italy | r 4,079 | 4,872 | 5,206 |
| Canada | 4,914 | 5,048 | 5,175 |
| Australia | 3,340 | 4,058 | e 4,800 |
| Mexico | 4,558 | 4,319 | e 4,300 |
| Romania | 3,147 | 3,296 | 3,923 |
| Germany, East | 2,187 | 2,286 | e 3,400 |
| Netherlands | 2,803 | 3,044 | 3,387 |
| Poland | 3,010 | 3,079 | 3,295 |
| Spain | r 1,866 | 2,022 | e 2,200 |
| Brazil | 2,168 | 1,855 | e 1,900 |
| Colombia | 1,023 | 1,313 | e 1,400 |
| Japan | 687 | 1,015 | 1,115 |
| Bahamas | 807 | 1,121 | 1,027 |
| Argentina | r 821 | 699 | e 700 |
| Total | r 135,594 | 139,328 | 146,163 |
| All others | r 10,819 | 11,865 | 11,103 |
| Grand total | r 146,413 | 151,193 | 157,266 |

e Estimate. p Preliminary. r Revised.

## Table 48.—Leading world producers of elemental sulfur [1]

(Thousand metric tons)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| United States | 10,382 | 11,096 | 11,602 |
| U.S.S.R.e | 7,500 | 8,050 | 8,300 |
| Canada | 7,627 | 8,127 | 7,953 |
| Poland | 3,176 | 3,801 | 4,373 |
| Japan | 2,622 | 2,767 | 2,808 |
| Mexico | 944 | 1,672 | 2,387 |
| France | 1,818 | 1,856 | 1,950 |
| Germany, West | 892 | 1,161 | 1,340 |
| Spain | 1,109 | 1,241 | 1,319 |
| Italy | 1,022 | 905 | 893 |
| Total | 37,092 | 40,676 | 42,925 |
| All others | 8,274 | 8,369 | 8,635 |
| Grand total | 45,366 | 49,045 | 51,560 |

e Estimate. p Preliminary.
[1] This table has been revised to include all recorded production of sulfur from mineral materials regardless of its origin or of the form in which it is recovered.

## Table 49.—Leading world producers of coal (all grades)

(Million metric tons)

| Country | 1972 | | | 1973 | | | 1974 p | | |
|---|---|---|---|---|---|---|---|---|---|
| | Lignite | Bituminous and anthracite | Total | Lignite | Bituminous and anthracite | Total | Lignite | Bituminous and anthracite | Total |
| U.S.S.R | 156 | r 499 | r 655 | 157 | 511 | 668 | 160 | e 519 | e 679 |
| United States | 10 | 537 | 547 | 13 | 530 | 543 | 14 | 537 | 551 |
| China, People's Republic of e | (1) | 400 | 400 | (1) | 430 | 430 | (1) | 450 | 450 |
| Germany, East | 248 | 1 | 249 | 246 | 1 | 247 | 243 | e 1 | e 244 |
| Germany, West | 110 | r 102 | r 212 | 119 | 97 | 216 | 126 | 95 | 221 |
| Poland | 38 | 151 | 189 | 39 | 157 | 196 | 40 | 162 | 202 |
| Czechoslovakia | r 85 | 28 | 113 | 81 | 28 | 109 | 82 | 28 | 110 |
| United Kingdom | -- | r 125 | r 125 | -- | 135 | 135 | -- | e 109 | e 109 |
| Australia | 24 | 60 | 84 | 25 | 61 | 86 | 28 | 64 | 92 |
| India | 3 | 75 | 78 | 3 | 77 | 80 | 3 | 83 | 86 |
| South Africa, Republic of | -- | 58 | 58 | -- | 62 | 62 | -- | 65 | 65 |
| Korea, North e | (1) | 34 | 34 | (1) | 37 | 37 | (1) | 41 | 41 |
| Yugoslavia | 30 | 1 | 31 | 32 | 1 | 33 | 33 | 1 | 34 |
| Romania | 17 | 7 | 24 | 18 | 7 | 25 | 20 | 7 | 27 |
| Hungary | 22 | 3 | 25 | 23 | 3 | 26 | 23 | 3 | 26 |
| France | 3 | 30 | 33 | 3 | 26 | 29 | 3 | 23 | 26 |
| Bulgaria | r 27 | (2) | r 27 | 26 | (2) | 26 | 24 | (2) | 24 |
| Total | r 773 | r 2,111 | r 2,884 | 785 | 2,163 | 2,948 | 799 | 2,188 | 2,987 |
| All others | r 20 | r 113 | r 133 | 34 | 107 | 141 | 34 | 109 | 143 |
| Grand total | r 793 | r 2,224 | r 3,017 | 819 | 2,270 | 3,089 | 833 | 2,297 | 3,130 |

e Estimate. p Preliminary. r Revised.
[1] Output small, included under anthracite and bituminous.
[2] Less than ½ unit.

## Table 50.—Leading world producers of marketed natural gas
(Billion cubic feet)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| United States | 22,532 | 22,648 | 21,601 |
| U.S.S.R | 7,818 | 8,334 | 9,217 |
| Canada | 2,914 | 3,119 | 3,037 |
| Netherlands | 2,052 | 2,495 | 2,957 |
| China, People's Republic of e | 750 | 950 | 1,200 |
| United Kingdom | r 939 | 1,018 | 1,160 |
| Romania | 926 | 976 | 1,005 |
| Iran | 448 | 702 | 787 |
| Germany, West | r 637 | 706 | 713 |
| Mexico | 496 | 542 | 561 |
| Italy | 501 | 541 | 539 |
| Venezuela | 388 | 460 | 476 |
| Germany, East | r 179 | 248 | 293 |
| France | 260 | 262 | 269 |
| Argentina | 218 | 238 | 256 |
| Total | r 41,058 | 43,239 | 44,071 |
| All others | r 2,367 | 2,900 | 3,059 |
| Grand total | r 43,425 | 46,139 | 41,180 |

e Estimate. p Preliminary. r Revised.

## Table 51.—Leading world producers of crude oil
(Million 42-gallon barrels)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| U.S.S.R | r 2,896 | 3,094 | 3,374 |
| United States | 3,455 | 3,361 | 3,203 |
| Saudi Arabia [1] | 2,202 | 2,773 | 3,096 |
| Iran | 1,839 | 2,139 | 2,211 |
| Venezuela | 1,178 | 1,229 | 1,086 |
| Kuwait [1] | 1,201 | 1,102 | 930 |
| Nigeria | 665 | 750 | 823 |
| Iraq | r 529 | 737 | 680 |
| Canada | 561 | 648 | 617 |
| United Arab Emirates | 440 | 559 | 616 |
| Libya | 820 | 794 | 555 |
| Indonesia | r 396 | 489 | r 502 |
| China, People's Republic of e | r 216 | r 365 | 475 |
| Algeria | r 385 | 401 | 373 |
| Mexico | r 185 | 191 | 238 |
| Qatar | 177 | 208 | 189 |
| Argentina | 158 | 154 | 151 |
| Australia | 120 | 142 | 141 |
| Romania | 105 | 107 | 108 |
| Oman | 103 | 107 | 106 |
| Gabon | 46 | 55 | 74 |
| Total | r 17,677 | 19,405 | 19,548 |
| All others | r 924 | 963 | 968 |
| Grand total | r 18,601 | 20,368 | 20,516 |

e Estimate. p Preliminary. r Revised.
[1] Data for both Kuwait and Saudi Arabia include those countries share of production from the Kuwait-Saudi Arabia Partitioned Zone.

## Table 52.—Major world trade in bauxite and alumina in 1973 [1]

(Thousand metric tons)

| Source country | 1973 production by source country [2] | 1973 export by source country [2] | Recipient country [3] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Austria | Canada | France | West Germany | Italy | Japan | Netherlands | Norway | Spain | Sweden | United Kingdom | United States [4] | U.S.S.R. | Selected others |
| **Bauxite:** | | | | | | | | | | | | | | | | |
| Australia | 17,596 | NA | -- | (5) | 305 | 1,613 | 454 | 3,457 | -- | -- | 1 | 14 | 12 | 365 | -- | 145 |
| Dominican Republic | 1,145 | 1,416 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1,118 | -- | -- |
| France | 3,299 | 55 | -- | 48 | XX | 31 | 1 | -- | -- | -- | -- | -- | -- | -- | -- | 7 |
| Ghana | 310 | 312 | -- | -- | -- | 52 | -- | -- | -- | -- | 7 | -- | 225 | -- | -- | -- |
| Greece | 2,748 | 1,369 | -- | -- | 136 | 55 | -- | 16 | 124 | 2 | 49 | 26 | 48 | 45 | 635 | 14 |
| Guinea | 3,660 | NA | -- | 102 | 78 | 111 | 60 | -- | -- | -- | -- | -- | -- | 130 | -- | -- |
| Guyana | 3,276 | 2,363 | -- | 1,415 | 47 | 52 | 20 | 43 | 3 | (5) | 38 | 7 | -- | 490 | -- | 21 |
| Haiti | 648 | [6]790 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 501 | -- | -- |
| Hungary | 2,600 | 659 | -- | -- | -- | 99 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| India | 1,092 | 28 | -- | -- | -- | -- | -- | 22 | -- | -- | -- | -- | -- | -- | -- | -- |
| Indonesia | 1,106 | 1,287 | -- | 148 | -- | -- | -- | 1,137 | -- | -- | -- | -- | -- | -- | -- | -- |
| Jamaica | 13,600 | 7,390 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 8,350 | -- | -- |
| Malaysia | 1,143 | 1,019 | -- | 88 | -- | -- | -- | 931 | -- | -- | -- | -- | -- | -- | -- | -- |
| Sierra Leone | 663 | 663 | -- | 357 | -- | 303 | 39 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Surinam | 6,686 | NA | -- | 422 | 13 | 26 | 8 | 6 | -- | -- | 11 | -- | -- | 2,694 | -- | -- |
| United States | 1,909 | 12 | -- | 20 | -- | 2 | (5) | -- | -- | -- | -- | -- | -- | XX | -- | (5) |
| Yugoslavia | 2,167 | 1,707 | -- | -- | -- | 348 | 219 | -- | -- | -- | 1 | -- | -- | -- | 690 | -- |
| Other and not specified | 6,798 | NA | 28 | 38 | 9 | 327 | 15 | 3 | 1 | 1 | 2 | 2 | 14 | 8 | 148 | 13 |
| Total | 70,446 | NA | 28 | 2,638 | 588 | 3,019 | 816 | 5,615 | 128 | 3 | 109 | 49 | 299 | 13,701 | 1,473 | 200 |
| **Alumina:** | | | | | | | | | | | | | | | | |
| Australia | 4,025 | 3,507 | -- | 334 | -- | 1 | -- | 443 | -- | -- | -- | -- | -- | 1,787 | -- | 94 |
| Canada | 1,134 | 29 | -- | XX | 1 | (5) | 2 | -- | -- | (5) | (5) | (5) | -- | 19 | -- | -- |
| France | 1,268 | 408 | [7]6 | -- | XX | 20 | 120 | (5) | 62 | 29 | 140 | (5) | 2 | 1 | -- | 13 |
| Germany, West | 905 | 216 | [7]8 | (5) | 14 | XX | 5 | 1 | 31 | 1 | 4 | 24 | 3 | 3 | -- | 13 |
| Greece | 470 | 162 | -- | -- | -- | -- | 26 | -- | 131 | -- | -- | -- | -- | -- | -- | -- |
| Guinea | 605 | [e]550 | -- | 14 | -- | 19 | -- | -- | -- | 147 | 120 | -- | 13 | 19 | -- | 37 |
| Guyana | 259 | 238 | -- | 2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 29 | 134 | -- |
| Hungary | [e]655 | 598 | [7]89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 345 | 7 |
| Jamaica | 2,416 | [8]2,416 | -- | 215 | -- | -- | -- | -- | -- | 596 | 51 | 101 | 339 | 820 | 79 | -- |
| Japan | 1,987 | 183 | -- | -- | -- | -- | -- | XX | -- | -- | (5) | -- | -- | 66 | -- | 1 |
| Surinam | 1,429 | [8]1,217 | -- | 4 | -- | 283 | -- | -- | 207 | 268 | -- | -- | -- | 345 | -- | 4 |
| United States | 6,662 | 694 | -- | 284 | 2 | 3 | 3 | 3 | (5) | 208 | (5) | 59 | 5 | XX | 205 | 1 |
| Yugoslavia | 275 | 8 | -- | -- | -- | -- | 23 | -- | -- | -- | -- | -- | -- | (5) | -- | -- |
| Other and not specified | 4,376 | NA | [9]95 | (5) | 4 | 51 | 10 | 5 | (5) | 7 | 12 | 4 | 184 | 1 | 139 | 28 |
| Total | 26,466 | NA | 198 | 853 | 21 | 377 | 189 | 452 | 431 | 1,256 | 327 | 188 | 546 | 3,090 | 902 | 198 |

[e] Estimate. NA Not available. XX Not applicable.

[1] Data presented are compiled from import statistics of countries listed as recipient countries unless otherwise specified and, as such, are incomplete, but are believed to account for the overwhelming share of total world movement of bauxite and alumina.

[2] Unless otherwise specified, figures are those reported in latest country chapter of Volume III, Minerals Yearbook. Data on bauxite production are on dry equivalent basis for a number of countries, and as such may be reported on a different basis from bauxite exports, which almost universally are on a gross weight basis and which are obtained from the Statistical Office of the United Nations and other sources. Data on alumina production are generally for output prior to calcination, while data on alumina exports, also from the Statistical Office of the United Nations and official country source data, include aluminum hydroxide and thus may not be exactly comparable.

[3] Countries selected are most of the world's significant aluminum producers that depend upon imports of bauxite and/or alumina for a significant share of their raw material requirements, plus a few minor countries for which data were readily available. Data are from the Statistical Office of the United Nations except for the U.S.S.R. and Canadian figures, which are from official Soviet and Canadian sources.

[4] Includes U.S. Virgin Islands.

[5] Less than ½ unit.

[6] Data for fiscal year ending September 1973.

[7] Data represent export figures of source country.

[8] World Mining, June 25, 1975.

[9] Figure represents difference between reported detail and reported total.

## Table 53.—Major trade in iron ores, concentrates, and agglomerates (excluding roasted pyrite) [1] in 1973

(Thousand metric tons)

| Source country | Recorded total 1973 export of source country [3] | Recorded imports of principal recipient country [2] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Canada | United States | Belgium-Luxembourg | Czechoslovakia [4] | France | Germany, West | Hungary | Italy |
| Algeria | 1,255 | -- | -- | 300 | 121 | 5 | -- | -- | 59 |
| Angola | 6,330 | -- | 40 | 190 | (4) | 371 | 1,397 | -- | 58 |
| Australia | [5]74,221 | -- | 472 | 1,765 | (4) | 831 | 2,777 | -- | 1,780 |
| Brazil | [5]44,963 | 484 | 3,234 | 1,296 | 404 | 3,109 | 11,043 | -- | 1,933 |
| Canada | 37,667 | XX | 21,975 | 276 | (4) | 320 | 3,886 | -- | 1,942 |
| Chile | [6]8,900 | -- | 208 | -- | (4) | -- | 155 | -- | -- |
| France | 19,454 | -- | (6) | 14,215 | (4) | XX | 3,499 | -- | (6) |
| India | 21,285 | -- | (6) | 177 | 691 | (6) | 12 | 105 | -- |
| Liberia | [7]25,671 | -- | 2,778 | 1,291 | (4) | 1,707 | 8,543 | -- | 3,764 |
| Malaysia | 224 | -- | -- | -- | (4) | -- | -- | -- | -- |
| Mauritania | 10,331 | -- | 48 | 1,103 | (4) | 1,881 | 1,008 | -- | 1,193 |
| Norway | 2,988 | -- | -- | (8) | [9]11 | (8) | [8]1,532 | -- | -- |
| Peru | [6]9,400 | -- | 1,525 | -- | (4) | 450 | 270 | -- | 101 |
| Philippines | 1,966 | -- | 25 | -- | (4) | -- | -- | -- | -- |
| Sierra Leone | 2,405 | -- | -- | -- | (4) | -- | 661 | -- | -- |
| South Africa, Republic of | [5]3,419 | -- | -- | -- | (4) | 115 | 156 | -- | -- |
| Spain | 1,661 | -- | -- | 74 | (4) | 385 | 606 | -- | -- |
| Swaziland | 1,993 | -- | -- | -- | (4) | -- | -- | -- | -- |
| Sweden | 32,917 | 33 | 278 | [8]9,911 | 401 | [8]2,039 | [8]11,237 | -- | 189 |
| U.S.S.R | 41,400 | -- | -- | -- | 11,557 | -- | 431 | 3,607 | 1,177 |
| United States | 2,790 | 2,172 | XX | -- | (4) | (6) | 98 | -- | -- |
| Venezuela | [5]21,698 | -- | 13,359 | 1,289 | (4) | 142 | 2,551 | -- | 1,526 |
| Other countries | [10]4,677 | -- | 49 | 528 | (4) | 174 | 463 | (6) | 471 |
| Origin unreported | XX | -- | -- | 2 | 26 | 1 | -- | -- | -- |
| Total | 377,615 | 2,689 | 43,991 | 32,417 | 13,211 | 11,530 | 50,325 | 3,712 | 14,193 |

| Source country | Recorded imports of principal recipient country [2] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Netherlands | Poland [4] | Romania [4] | United Kingdom [4] | Other Europe [11] | Japan | Other Asia and Pacific [12] | Other Western Hemisphere [13] | Total of listed imports |
| Algeria | -- | (4) | 1,212 | (4) | -- | -- | -- | -- | 1,697 |
| Angola | -- | (4) | (4) | 823 | 199 | 2,938 | -- | -- | 6,011 |
| Australia | 220 | (4) | (4) | 1,235 | 1,391 | 64,239 | 10 | -- | 74,720 |
| Brazil | 1,219 | 230 | 260 | 2,437 | 3,065 | 12,821 | 505 | 1,160 | 43,200 |
| Canada | 169 | (4) | (4) | 5,476 | 795 | 3,357 | 9 | -- | 38,205 |
| Chile | -- | (4) | (4) | (4) | -- | 8,493 | -- | 54 | 8,910 |
| France | (6) | (4) | (4) | (4) | 4 | -- | -- | 1 | 17,719 |
| India | -- | 429 | 1,973 | (4) | 30 | 19,112 | 241 | -- | 22,770 |
| Liberia | 2,465 | (4) | (4) | 869 | 651 | 2,456 | -- | -- | 24,524 |
| Malaysia | -- | (4) | (4) | (4) | -- | 203 | (6) | -- | 203 |
| Mauritania | 52 | (4) | (4) | 2,231 | 789 | 1,332 | -- | -- | 9,637 |
| Norway | (8) | 281 | (4) | 1,076 | 324 | -- | -- | -- | 3,224 |
| Peru | 49 | (4) | (4) | (4) | -- | 6,133 | -- | -- | 8,528 |
| Philippines | -- | (4) | (4) | (4) | -- | 2,312 | 5 | -- | 2,342 |
| Sierra Leone | 635 | (4) | (4) | (4) | -- | 1,059 | -- | -- | 2,355 |
| South Africa, Republic of | -- | (4) | (4) | 64 | 110 | 3,098 | -- | -- | 3,543 |
| Spain | 226 | (4) | (4) | 300 | -- | -- | -- | -- | 1,591 |
| Swaziland | -- | (4) | (4) | (4) | -- | 1,671 | -- | -- | 1,671 |
| Sweden | [8]1,936 | 981 | (4) | 4,671 | 1,616 | 213 | -- | -- | 33,505 |
| U.S.S.R | -- | 10,624 | 5,799 | 1,576 | 4,749 | 1,324 | -- | -- | 40,844 |
| United States | -- | (4) | (4) | (4) | -- | 528 | (6) | 1 | 2,799 |
| Venezuela | -- | (4) | (4) | 1,716 | 493 | -- | -- | -- | 21,076 |
| Other countries | 1 | (4) | 101 | (4) | 121 | 3,440 | 22 | 94 | [14]5,464 |
| Origin unreported | 2 | 3 | 156 | 444 | 10 | -- | -- | -- | 644 |
| Total | 6,974 | 12,548 | 9,501 | 22,918 | 14,347 | 134,724 | 792 | 1,310 | 375,182 |

[1] Disparities between recorded total exports of source countries and totals of recorded imports of recipient countries from each listed source country are generally due to (1) time lag between shipment and receipt and (2) the fact that the latter totals are incomplete, representing only the imports of the nations listed in the column heads and in footnotes 11, 12 and 13.

[2] Unless otherwise specified, data are compiled from official import statistics of listed recipient countries.

[3] Unless otherwise specified, data are from official export statistics of listed source countries.

[4] Official import statistics for Czechoslovakia, Poland, Romania, and the United Kingdom do not fully distribute total imports by country of origin, and therefore do not clearly indicate whether these nations received shipments from any of the source countries where this footnote has been entered.

[5] Official mineral statistics publication of source country rather than official trade returns.
[6] Less than 500 metric tons.
[7] World Mining, June 25, 1975, p. 138.
[8] Figures adjusted from those reported in official import statistics of Belgium-Luxembourg, France, West Germany, and the Netherlands to compensate for ores originating in Sweden and recorded as a part of the exports of that country in official Swedish export statistics, but shipped through Narvik, Norway, and as a result credited in recipient country's import statistics as originating in Norway.
[9] Official Norwegian export statistics (an equal amount has been subtracted from the total tonnage for which no origin was reported).
[10] Summation of (1) recorded exports of the following countries, with export quantity following country name, in thousand metric tons: Austria—1; Belgium-Luxembourg—77; Bolivia—2; Denmark—6; West Germany—6; Hong Kong—159; Iran—1; Republic of Korea (South Korea)—261; Morocco—490; Netherlands—540; New Zealand—1,959; Poland—2; Tunisia—424; and Switzerland—4; together with (2) apparent exports (as measured by imports of trading partner countries) with apparent export quantity following country name, in thousand metric tons, and trading partner countries listed in parentheses: Czechoslovakia—42 (Austrian imports only); Indonesia—280 (Japanese imports only); North Korea—423 (Japanese imports only); Panama—73 (Mexican imports only). In addition to the foregoing list of countries, Italy, Japan, Portugal, the United Kingdom, and Yugoslavia recorded iron ore exports, but each of these nations individually exported less than 500 tons apiece.
[11] Includes the following countries with recorded total imports of each following the country name, in thousand metric tons: Austria—1,970; Bulgaria—1,602 (based on export data of the U.S.S.R. only); Denmark—2; Finland—947; East Germany—2,902 (based on export data of Sweden—170 and the U.S.S.R.—2,732); Greece—854; Norway—44; Portugal—492; Spain—5,116; Sweden—less than one-half unit; Switzerland—28; and Yugoslavia—390.
[12] Includes the following countries with recorded total imports of each following the country name, in thousand metric tons: Australia—15; Republic of Korea (South Korea)—467; Malaysia—14; Singapore—50.
[13] Includes the following countries with recorded total imports of each following the country name, in thousand metric tons: Argentina—1,235; Brazil—less than one-half unit; Mexico—75; Venezuela—less than one-half unit.
[14] Includes the following reported source countries with total quantity credited to each following the country name in thousand metric tons: Argentina—31; Belgium-Luxembourg—47; Bolivia—21; Czechoslovakia—42; Denmark 8; Gabon—24; West Germany—132; Greece—37; Hong Kong—149; Indonesia—280; Iran—6; Italy—64; Japan—137; North Korea—423; South Korea—280; Libya—369; Malta—32; Morocco—377; Mozambique—281; Netherlands—122; New Zealand—2,029; Panama—73; Portugal—113; Tunisia—359; Yugoslavia—3.

## Table 54.—Major world trade in unrefined and refined unwrought copper in 1973 [1]

(Thousand metric tons)

| Source country | Destination | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Belgium-Luxembourg | Brazil | People's Republic of China | Czechoslovakia | France | Germany, West | Italy | Japan | Netherlands | Spain | Sweden | Switzerland | United Kingdom | United States | Other and unspecified | Total [2] |
| Belgium-Luxembourg | XX | 3 | -- | (3) | 136 | 77 | 21 | (3) | 20 | 9 | 13 | 9 | 25 | 4 | 11 | 328 |
| Canada | 7 | 1 | -- | -- | 12 | 27 | 7 | 10 | 1 | 2 | 4 | 3 | 92 | 116 | 6 | 288 |
| Chile [4] | 10 | 12 | 56 | -- | 20 | 104 | 46 | 34 | -- | 8 | 18 | 1 | 83 | 58 | [5]97 | 547 |
| Germany, West | 19 | 4 | 9 | -- | 27 | XX | 3 | 2 | 5 | 2 | (3) | 7 | 43 | 7 | 22 | 150 |
| Peru [4] | 16 | -- | 22 | -- | (3) | 16 | -- | 18 | -- | -- | -- | -- | 4 | 57 | 35 | 168 |
| U.S.S.R | 9 | (3) | -- | 38 | -- | 19 | 4 | 17 | 28 | -- | 5 | -- | 14 | -- | [6]104 | 238 |
| United Kingdom | 1 | 1 | 36 | -- | 6 | 15 | 14 | 7 | 4 | 8 | 3 | (3) | XX | 7 | 9 | 111 |
| United States | 8 | 20 | -- | -- | 21 | 17 | 29 | 42 | 3 | -- | 1 | 1 | 11 | XX | 26 | 179 |
| Zaire [4] | 307 | -- | -- | -- | 32 | 18 | 62 | 10 | 8 | -- | -- | -- | 7 | -- | 5 | 449 |
| Zambia [4] | 5 | 34 | 10 | -- | 56 | 69 | 78 | 182 | 7 | 10 | 6 | 10 | 135 | 5 | [7]63 | 670 |
| Other and unspecified [8] | 17 | (3) | 7 | -- | 23 | 64 | 13 | (3) | 12 | 2 | 4 | 3 | 26 | 44 | 42 | 257 |
| Total | 399 | 75 | 140 | 38 | 333 | 426 | 277 | 322 | 88 | 41 | 54 | 34 | 433 | 298 | 420 | 3,378 |

XX Not applicable.

[1] Unless otherwise specified, data are complied from export statistics for countries listed as source countries in stub of table.

[2] Detail may not add to listed total due to rounding.

[3] Less than ½ unit.

[4] World Bureau of Metal Statistics, World Metal Statistics, v. 29, No. 3, 1976.

[5] Includes 32,300 tons to Argentina.

[6] Includes 31,300 tons to Hungary and 17,000 tons to Romania.

[7] Includes 29,000 tons to India.

[8] Includes the following countries (total exports in thousand tons in parentheses following names): Australia (NA); Austria (10); Denmark (2); Finland (24); France (16); Italy (8); Japan (30); Netherlands (13); New Zealand (1); Norway (34); Spain (19); Switzerland (6); Yugoslavia (78).

## Table 55.—Major world trade in steel ingots and semimanufactures in 1973, by area
(Thousand metric tons)

| Exporting country and area | Destination [1] | | | | | | |
|---|---|---|---|---|---|---|---|
| | North America | | | Europe | | | |
| | Canada | United States | Latin America [2] | European Economic Community | European Free Trade Association | Other market economy countries | Centrally planned economy countries [3] |
| North America: | | | | | | | |
| Canada [4] | XX | 1,348.8 | 147.3 | 107.0 | 1.3 | 10.8 | 15.8 |
| United States | 847.8 | XX | 1,361.6 | 402.5 | 86.3 | 48.6 | 70.4 |
| Total | 847.8 | 1,348.8 | 1,508.9 | 509.5 | 87.6 | 59.4 | 86.2 |
| Europe: | | | | | | | |
| Market economy countries: | | | | | | | |
| European Economic Community: | | | | | | | |
| Belgium-Luxembourg | 84.0 | 1,072.0 | 311.0 | 11,026.0 | 882.0 | 342.0 | 912.0 |
| Denmark | -- | .3 | 1.7 | 89.2 | 161.5 | 5.3 | 2.8 |
| France | 86.5 | 895.5 | 248.5 | 4,017.6 | 878.9 | 334.3 | 627.0 |
| Germany, West [5] | 193.9 | 1,994.3 | 529.4 | 7,541.2 | 1,811.8 | 770.9 | 2,423.5 |
| Italy | 11.4 | 165.9 | 67.4 | 1,264.3 | 254.4 | 199.1 | 571.4 |
| Netherlands [6] | -- | 598.0 | 44.0 | 2,341.0 | 455.0 | 260.0 | 106.0 |
| United Kingdom | 164.0 | 916.5 | 391.0 | 952.0 | 430.5 | 362.9 | 119.8 |
| Subtotal | 539.8 | 5,642.5 | 1,593.0 | 27,231.3 | 4,874.1 | 2,274.5 | 4,762.5 |
| European Free Trade Association: | | | | | | | |
| Austria | 6.1 | 17.1 | 8.7 | 815.3 | 228.7 | 89.5 | 207.2 |
| Norway | .1 | 2.9 | 5.3 | 415.2 | 131.0 | 52.6 | 12.1 |
| Portugal | .2 | .1 | .3 | 3.9 | .9 | 3.2 | .2 |
| Sweden | 20.3 | 143.3 | 41.6 | 1,031.6 | 241.4 | 195.8 | 178.3 |
| Switzerland [7] | 1.3 | 3.4 | .3 | 84.2 | 33.4 | 6.2 | 1.1 |
| Subtotal | 28.0 | 166.8 | 56.2 | 2,350.2 | 635.4 | 347.3 | 398.9 |
| Other: | | | | | | | |
| Finland | -- | 10.8 | NA | 209.5 | 260.2 | NA | 9.4 |
| Greece | -- | 59.1 | -- | 85.6 | .1 | 99.5 | 9.3 |
| Spain [7] | .9 | 99.2 | 354.2 | 831.4 | 48.3 | 29.6 | 140.3 |
| Yugoslavia | 1.0 | 12.0 | 1.0 | 185.0 | 68.0 | 16.0 | 339.0 |
| Subtotal | 1.9 | 181.1 | 355.2 | 1,311.5 | 376.6 | 145.1 | 498.0 |
| Centrally planned economy countries: | | | | | | | |
| Bulgaria | -- | -- | 32.9 | 309.2 | 14.3 | 93.7 | 304.0 |
| Czechoslovakia | 90.3 | 30.3 | 9.1 | 763.6 | 201.2 | 325.4 | 1,040.9 |
| Germany, East [8] | -- | -- | -- | 129.2 | 17.9 | 49.4 | -- |
| Hungary | .1 | .1 | 7.6 | 264.6 | 167.9 | 258.5 | 237.1 |
| Poland | 6.2 | 83.5 | 42.4 | 272.0 | 149.1 | 116.4 | 593.2 |
| Romania [9] | -- | -- | -- | 197.8 | 4.2 | 14.1 | 575.9 |
| U.S.S.R | -- | -- | 217.2 | 48.0 | 13.0 | 376.2 | 5,354.1 |
| Subtotal | 96.6 | 113.9 | 309.2 | 1,984.4 | 567.6 | 1,233.7 | 8,105.2 |
| Total | 666.3 | 6,104.3 | 2,313.6 | 32,877.4 | 6,453.7 | 4,000.6 | 13,764.6 |
| Africa: South Africa, Republic of | 4.1 | 53.6 | 17.1 | 106.4 | .4 | 2.5 | -- |
| South Asia and Far East: | | | | | | | |
| India | .2 | 17.5 | .3 | 2.8 | .1 | .2 | 40.1 |
| Japan | 564.0 | 4,696.0 | 2,828.0 | 1,282.0 | 484.0 | 626.0 | 803.0 |
| Total | 564.2 | 4,713.5 | 2,828.3 | 1,284.8 | 484.1 | 626.2 | 843.1 |
| Oceania: Australia [4 10] | 18.0 | 106.0 | 82.0 | 279.0 | 34.0 | -- | -- |
| Grand total | 2,100.4 | 12,326.2 | 6,749.9 | 35,057.1 | 7,059.8 | 4,688.7 | 14,693.9 |

See footnotes at end of table.

## Table 55.—Major world trade in steel ingots and semimanufactures in 1973, by area—Continued

(Thousand metric tons)

| Exporting country and area | Destination [1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | South Asia and Far East | | | | | |
| | Africa | Near East [11] | Japan | Other market economy countries | Centrally planned economy countries [12] | Oceania | Unallocated | Total |
| North America: | | | | | | | | |
| Canada [4] | 44.7 | 51.6 | 0.2 | 35.0 | 0.5 | 14.8 | -- | 1,777.8 |
| United States | 137.9 | 132.1 | 12.9 | 572.7 | -- | 35.0 | -- | 3,707.8 |
| Total | 182.6 | 183.7 | 13.1 | 607.7 | .5 | 49.8 | -- | 5,485.6 |
| Europe: | | | | | | | | |
| Market economy countries: | | | | | | | | |
| European Economic Community: | | | | | | | | |
| Belgium-Luxembourg | 566.0 | 602.0 | 1.0 | 132.0 | 29.0 | 9.0 | -- | 15,968.0 |
| Denmark | 0.5 | 6.7 | .2 | 3.6 | -- | -- | -- | 271.8 |
| France | 651.1 | 375.2 | .3 | 90.9 | 56.5 | 29.4 | -- | 8,291.7 |
| Germany, West [5] | 429.2 | 544.3 | 2.5 | 307.6 | 682.7 | 32.0 | -- | 17,263.3 |
| Italy | 553.9 | 296.9 | .4 | 21.6 | 38.6 | 2.0 | 4.0 | 3,451.3 |
| Netherlands [6] | 118.0 | 79.0 | NA | 32.0 | 29.0 | NA | 10.0 | 4,072.0 |
| United Kingdom | 234.3 | 189.4 | 1.7 | 365.2 | 45.6 | 84.1 | -- | 4,257.0 |
| Subtotal | 2,553.0 | 2,093.5 | 6.1 | 952.9 | 881.4 | 156.5 | 14.0 | 53,575.1 |
| European Free Trade Association: | | | | | | | | |
| Austria | 6.4 | 32.5 | .5 | 4.6 | 8.9 | 2.1 | 8.6 | 1,436.2 |
| Norway | 2.5 | 3.8 | NA | 3.2 | -- | .1 | -- | 628.8 |
| Portugal | 17.8 | 1.8 | -- | .2 | -- | -- | .1 | 28.7 |
| Sweden | 13.4 | 9.4 | 4.3 | 21.2 | 23.7 | 7.3 | -- | 1,931.6 |
| Switzerland [7] | .9 | 1.9 | -- | -- | -- | -- | 3.2 | 135.9 |
| Subtotal | 41.0 | 49.4 | 4.8 | 29.2 | 32.6 | 9.5 | 11.9 | 4,161.2 |
| Other: | | | | | | | | |
| Finland | NA | 34.0 | -- | -- | 1.2 | -- | -- | 525.1 |
| Greece | 29.2 | 28.3 | -- | -- | -- | -- | .2 | 311.3 |
| Spain [7] | 90.0 | 195.2 | NA | 4.3 | 14.3 | -- | 7.3 | 1,815.0 |
| Yugoslavia | 5.0 | 73.0 | -- | 12.0 | 16.0 | -- | -- | 728.0 |
| Subtotal | 124.2 | 330.5 | NA | 16.3 | 31.5 | -- | 7.5 | 3,379.4 |
| Centrally planned economy countries: | | | | | | | | |
| Bulgaria | 8.4 | 99.4 | -- | 17.3 | 1.0 | -- | 8.4 | 888.6 |
| Czechoslovakia | 52.3 | 312.7 | -- | 19.9 | 53.2 | -- | -- | 2,898.9 |
| Germany, East [8] | -- | -- | -- | -- | -- | -- | 1,316.5 | 1,513.0 |
| Hungary | 26.2 | 122.5 | -- | 35.4 | 13.7 | -- | -- | 1,133.7 |
| Poland | 13.0 | 45.1 | 1.6 | 34.2 | 45.7 | -- | -- | 1,402.4 |
| Romania [9] | .8 | .3 | -- | .8 | 104.7 | -- | 489.4 | 1,388.0 |
| U.S.S.R | 216.6 | 264.4 | -- | 102.1 | 65.2 | -- | 429.7 | 7,086.5 |
| Subtotal | 317.3 | 844.4 | 1.6 | 209.7 | 283.5 | -- | 2,244.0 | 16,311.1 |
| Total | 3,035.5 | 3,317.8 | 12.5 | 1,208.1 | 1,229.0 | 166.0 | 2,277.4 | 77,426.8 |
| Africa: South Africa, Republic of | -- | 39.3 | .1 | 11.1 | -- | 2.4 | 394.5 | 631.5 |
| South Asia and Far East: | | | | | | | | |
| India | 6.3 | 32.6 | -- | 46.6 | -- | 4.9 | 10.3 | 161.9 |
| Japan | 979.0 | 1,867.0 | XX | 6,959.0 | 2,670.0 | 1,047.0 | -- | 24,805.0 |
| Total | 985.3 | 1,899.6 | -- | 7,005.6 | 2,670.0 | 1,051.9 | 10.3 | 24,966.9 |
| Oceania: Australia [4 10] | 12.0 | 80.0 | -- | 535.0 | 33.0 | 202.0 | -- | 1,381.0 |
| Grand total | 4,215.4 | 5,520.4 | 25.7 | 9,367.5 | 3,932.5 | 1,472.1 | 2,682.2 | 109,891.8 |

NA Not available. XX Not applicable.

[1] Because some countries do not report destination for a portion of exports (see unallocated column), figures given for distribution of those countries' exports by continental area are not exactly correct. However, such unallocated quantities are sizable only in the case of some of the centrally planned economy countries and the Republic of South Africa.

[2] All Western Hemisphere areas except the United States and Canada.

[3] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the U.S.S.R.

[4] Excludes wheels, tires, and axles.

[5] Excludes exports to East Germany.

[6] Excludes exports to Belgium-Luxembourg, which were approximately 600,000 tons.

[7] Partial figure; derived from import data of partner countries. Source: Statistical Office of the United Nations. 1973 World Trade Annual. V. III, Walker and Co., New York, 1974, 475 pp.

[8] The distribution is composed of partial figures derived from import data of major trading partners utilizing the source in footnote 9. The total is taken from United Nations, 1973 Annual Bulletin of Steel Statistics for Europe, v. I, New York, 1974, p. 42.

[9] The distribution is official Romanian trade statistics and does not include ingots. The total includes ingots and is taken from the source in footnote 10.

[10] Year ended June 30, 1973.

[11] Bahrain, Cypress, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Muscat and Oman, Qatar, Saudi Arabia, People's Democratic Republic of Yemen, Syria, United Arab Emirates, Turkey, and Yemen Arab Republic.

[12] Consists of the People's Republic of China, North Korea, North Vietnam; Mongolia is included under other market economy South Asia and Far East, owing to its inseparability from this group in source.

## Table 56.—Major world trade in lead ores and concentrates [1]

(Thousand metric tons of contained metal)

| Destination | Exporting region | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | North America | Latin America [2] | Western Europe [3] | Eastern Europe [4] | Africa | Asia | Oceania | Origin not reported by continent | Total |
| 1973 | | | | | | | | | |
| United States | 16.4 | 43.6 | 0.1 | -- | -- | 13.0 | 19.7 | -- | 92.8 |
| Western Europe: | | | | | | | | | |
| Belgium-Luxembourg [5] | -- | 10.9 | 32.7 | 6.9 | 10.4 | -- | -- | 16.2 | 77.1 |
| France | 13.4 | 5.4 | 32.8 | -- | 25.8 | -- | -- | -- | 77.4 |
| Germany, West | 18.0 | 6.1 | 56.2 | -- | 10.6 | .9 | -- | -- | 91.8 |
| United Kingdom | -- | 10.8 | -- | -- | .5 | -- | 16.4 | 2.9 | 30.6 |
| Total | 31.4 | 33.2 | 121.7 | 6.9 | 47.3 | .9 | 16.4 | 19.1 | 276.9 |
| Japan | 81.1 | 25.9 | -- | -- | -- | 8.5 | 12.8 | 1.9 | 130.2 |
| Grand total | 128.9 | 102.7 | 121.8 | 6.9 | 47.3 | 22.4 | 48.9 | 21.0 | 499.9 |
| 1974 | | | | | | | | | |
| United States | 9.5 | 14.5 | -- | -- | -- | -- | 17.5 | -- | 41.5 |
| Western Europe: | | | | | | | | | |
| Belgium-Luxembourg [6] | -- | 12.9 | -- | -- | 11.6 | -- | -- | -- | 24.5 |
| France [7] | 21.4 | 3.6 | 38.0 | -- | 28.6 | -- | -- | .4 | 92.0 |
| Germany, West | 28.9 | 8.0 | 46.9 | 3.5 | 15.1 | 1.4 | -- | -- | 103.8 |
| United Kingdom | 9.5 | 9.5 | .6 | -- | .9 | -- | 14.3 | 7.9 | 42.7 |
| Total | 59.8 | 34.0 | 85.5 | 3.5 | 56.2 | 1.4 | 14.3 | 8.3 | 263.0 |
| Japan | 96.3 | 27.2 | -- | -- | -- | 10.4 | 6.7 | .1 | 140.7 |
| Grand total | 165.6 | 75.7 | 85.5 | 3.5 | 56.2 | 11.8 | 38.5 | 8.4 | 445.2 |

[1] Imports by countries other than those listed as destinations are believed to be generally smaller than those for listed countries.
[2] Includes Mexico.
[3] Includes Yugoslavia.
[4] Includes Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the U.S.S.R.
[5] Gross weight of ore for January through October only.
[6] Gross weight of ore for January through September only.
[7] Metal content of ore for January through September only.

Source: Monthly Bulletin of the International Lead and Zinc Study Group. Lead and Zinc Statistics, v. 14, No. 4, April 1974, p. 24; v. 15, No. 4, April 1975, p. 24.

## Table 57.—Major world trade in lead bullion and refined lead [1]

(Thousand metric tons of contained metal)

| Destination | Exporting region | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | North America | Latin America [2] | Western Europe [3] | Eastern Europe [4] | Africa | Asia | Oceania | Origin not reported by continent | Total [5] |
| 1973 | | | | | | | | | |
| United States | 56.2 | 57.3 | 1.6 | -- | 5.1 | -- | 41.3 | .1 | 161.6 |
| Western Europe: | | | | | | | | | |
| France | 1.0 | -- | 34.6 | 0.2 | 1.0 | .2 | -- | -- | 37.0 |
| Germany, West | 2.9 | 1.4 | 93.4 | -- | 1.6 | 15.0 | 17.8 | -- | 132.1 |
| Netherlands | 1.5 | 6.9 | 12.6 | 2.6 | -- | 1.7 | 10.9 | -- | 36.2 |
| Switzerland | 1.3 | 2.6 | 11.8 | -- | -- | -- | 1.3 | -- | 17.0 |
| United Kingdom | 45.3 | -- | -- | -- | 9.1 | -- | 156.9 | 2.5 | 213.8 |
| Other [6] | .7 | .5 | 15.2 | .1 | 4.0 | -- | -- | -- | 20.5 |
| Total | 52.7 | 11.4 | 167.6 | 2.9 | 15.7 | 16.9 | 186.9 | 2.5 | 456.6 |
| Japan | 30.6 | 7.2 | .2 | -- | 2.0 | 9.0 | 9.1 | .3 | 58.4 |
| Grand total | 139.5 | 75.9 | 169.4 | 2.9 | 22.8 | 25.9 | 237.3 | 2.9 | 676.6 |
| 1974 | | | | | | | | | |
| United States | 36.4 | 62.1 | 6.4 | -- | -- | 2.4 | 3.0 | .3 | 110.6 |
| Western Europe: | | | | | | | | | |
| France | 1.9 | .4 | 29.9 | .5 | .4 | -- | -- | .1 | 33.2 |
| Germany, West | 5.8 | .7 | 72.8 | .8 | 1.0 | 13.4 | 19.2 | .1 | 113.8 |
| Netherlands | .9 | 11.4 | 6.9 | -- | -- | 2.6 | 7.7 | -- | 29.5 |
| Switzerland | 1.1 | 3.6 | 16.2 | -- | -- | -- | 1.4 | -- | 22.3 |
| United Kingdom | 30.2 | -- | -- | -- | 4.8 | -- | 167.1 | 9.7 | 211.8 |
| Other [7] | -- | -- | .6 | -- | .4 | -- | -- | -- | 1.0 |
| Total | 39.9 | 16.1 | 126.4 | 1.3 | 6.6 | 16.0 | 195.4 | 9.9 | 411.6 |
| Japan | 9.4 | 4.4 | -- | -- | 3.7 | 4.3 | 7.4 | -- | 29.2 |
| Grand total | 85.7 | 82.6 | 132.8 | 1.3 | 10.3 | 22.7 | 205.8 | 10.2 | 551.4 |

[1] Imports of countries other than those listed are generally small individually (except for Eastern European Nations listed in footnote 4) but in aggregate apparently total about 125,000 tons per year. Total lead imports by East European countries including trade between countries of this group apparently total 70,000 tons or more per year.

[2] Includes Mexico.

[3] Includes Yugoslavia.

[4] Includes Bulgaria, Czechoslovakia, East Germany, Poland, and the U.S.S.R.

[5] Reported totals.

[6] January through November.

[7] Includes Denmark, January through December, and Norway, January through November.

Source: Monthly Bulletin of the International Lead and Zinc Study Group. Lead and Zinc Statistics, v. 15, No. 5, May 1974, p. 24; v. 15, No. 5, May 1975, p. 24.

## Table 58.—Manganese ore: World trade in 1973 [1]

(Gross weight, metric tons)

| Destination | (Source country) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Angola | Australia | Brazil | China, People's Republic of | Gabon | Ghana | India | Malaysia | Mexico | Morocco | South Africa, Republic of | U.S.S.R. | Zaire | Other [2] | Unspecified | Total |
| Argentina | -- | -- | 51,169 | -- | -- | 668 | -- | -- | 20 | -- | -- | -- | -- | 4,059 | -- | 55,916 |
| Belgium-Luxembourg | 44,455 | 23,114 | 26,206 | -- | [3]39,351 | -- | 11,077 | -- | -- | 5,989 | 228,700 | -- | 34,123 | 10,940 | 37 | 423,992 |
| Brazil | -- | -- | -- | -- | 8,668 | -- | -- | -- | -- | -- | -- | -- | -- | 621 | -- | 9,289 |
| Bulgaria [4] | NA | NA | -- | NA | NA | NA | 12,772 | -- | -- | -- | NA | 108,000 | NA | NA | NA | 120,772 |
| Canada | -- | -- | 23,205 | -- | 34,930 | -- | -- | -- | 377 | -- | 11,646 | 3,693 | 14,628 | 44,916 | 2 | 133,397 |
| Czechoslovakia [4] | NA | NA | 35,560 | NA | NA | NA | 12,381 | -- | -- | 2,270 | NA | 331,632 | NA | [5]189 | NA | 381,982 |
| France | 19,830 | 15,576 | 790 | 200 | 645,198 | -- | -- | -- | 52,347 | 29,958 | 639,370 | 19,526 | -- | 9,438 | 84 | 1,432,317 |
| Germany, East [4] | NA | NA | -- | NA | NA | NA | NA | -- | -- | -- | NA | 167,457 | NA | NA | NA | 167,457 |
| Germany, West | 50 | 176,551 | 61,294 | 100 | [3]69,659 | -- | -- | -- | -- | 11,620 | 376,058 | -- | 75 | 20,872 | 58 | 716,337 |
| Italy | -- | -- * | 17,454 | 220 | 91,902 | -- | -- | -- | -- | 6,410 | 159,792 | -- | 150 | 5,670 | 459 | 282,057 |
| Japan | -- | 626,473 | 29,450 | 42,281 | [3]213,842 | 18,457 | 694,999 | 55,414 | 60,095 | -- | 1,476,233 | 54,141 | 10,991 | 81,744 | -- | 3,364,120 |
| Korea, North [4] | NA | NA | -- | NA | NA | NA | NA | -- | -- | -- | NA | 21,000 | NA | NA | NA | 21,000 |
| Korea, Republic of | -- | 9,583 | -- | -- | -- | -- | 14,117 | 4,788 | -- | -- | 969 | -- | -- | 523 | -- | 29,980 |
| Netherlands | NA | NA | ([6]) | NA | [3]2,002 | NA | NA | -- | -- | ([6]) | NA | 2,714 | NA | 4,292 | [6]71,536 | 80,544 |
| Norway | -- | 72,382 | 171,354 | -- | [3]140,494 | 102,906 | -- | -- | -- | -- | 189,549 | 38,002 | -- | 80 | 9 | 714,776 |
| Poland | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 464,907 | -- | 60,581 | -- | 525,488 |
| Singapore | -- | -- | -- | -- | -- | 16,220 | -- | -- | -- | -- | -- | -- | -- | 2 | -- | 16,222 |
| Spain | -- | 26,881 | 22,134 | 959 | [7]52,386 | 58,830 | 25,196 | -- | 10,138 | -- | 124,378 | -- | 1,940 | 8,247 | 9 | 331,098 |
| Sweden | -- | -- | -- | -- | 675 | 6,846 | -- | -- | -- | -- | 31,408 | 19,965 | -- | 1,497 | -- | 60,391 |
| Taiwan | -- | 5,705 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5,083 | -- | 10,788 |
| United Kingdom | NA | NA | 172,490 | NA | [3]42,488 | 42,588 | NA | -- | -- | 9,375 | 246,648 | 11,512 | NA | 3,558 | 59,812 | 588,471 |
| United States | -- | 112,321 | 571,375 | -- | 356,557 | 35,348 | -- | -- | 95,272 | 23,974 | 107,989 | -- | 66,270 | 556 | -- | 1,369,662 |
| Yugoslavia | -- | -- | 16,383 | -- | 19,092 | -- | -- | -- | -- | -- | -- | 14,345 | -- | 6,867 | -- | 56,687 |
| Other [8] | -- | 249 | 1,998 | 4,890 | 25 | 3,595 | -- | -- | [9]3,212 | 240 | 120 | 2 | -- | 16,671 | 17 | 31,019 |
| Total recorded imports [10] | 64,335 | 1,068,835 | 1,200,862 | 48,650 | 1,717,269 | 285,458 | 770,492 | 60,202 | 221,461 | 89,836 | 3,592,860 | 1,256,896 | 128,177 | 286,406 | 132,023 | 10,923,762 |
| Total recorded exports [11] | NA | NA | 788,435 | NA | [12]1,957,592 | NA | 738,637 | 62,574 | 195,863 | 151,108 | [13]3,677,173 | 1,308,700 | [12]485,000 | [13]144,289 | -- | NA |

NA Not available.

[1] Compiled from official import statistics of the listed destination countries except where otherwise indicated.

[2] Includes the following countries except as indicated by footnote 13 (with total quantities credited to each in parentheses, following the country name, in metric tons): Argentina (2), Austria (20), Belgium-Luxembourg (38,709), Bolivia (479), Canada (556), France (32,373), West Germany (7,724), Greece (9,104), Hungary (14,052), Indonesia (7,339), Iran (9,552), Ireland (1,484), Italy (50), Japan (1,808), Mozambique (438), Netherlands (24,598), New Hebrides (33,605), Philippines (1,939), Portugal (6,278), Romania (21,956), Singapore (1,952), Sweden (214), Thailand (14,182), Turkey (473), Uganda (1,654), United Kingdom (1,462), United States (54,304). These figures represent reported origins of shipments received rather than reported exports of the listed countries, and the list includes a number of countries which do not produce manganese ore. Receipts from these countries presumably are either transshipments through the listed country or re-exports.

[3] Includes materials reported as originating in Congo (Brazzaville), but believed to have originated in Gabon, as follows, in metric tons: Belgium-Luxembourg—25,219; West Germany—69,659; Japan 2,892; Netherlands—2,002; Norway—42,133; and United Kingdom—42,488.

[4] Data compiled from export statistics of source countries.

[5] Data from export statistics of Sweden.

[6] Import statistics of the Netherlands include a substantial quantity of material originating from unreported origins; the bulk of this material is believed to have originated in Brazil and Morocco, on the basis of export statistics of those nations.

[7] Spanish import statistics officially report this as originating in the "Equatorial Customs Union;" it is believed that Gabon is the origin.

[8] Includes the following countries reporting imports (with total imports in parentheses, following the country name, in metric tons): Australia (4,870), Austria (742), Denmark (3,384), Finland (44), Greece (2,394), Hong Kong (662), Malaysia (West only) (834), Mexico (8,350), Morocco (28), Philippines (2,433), Portugal (123), and Thailand (334); as well as recorded exports of source countries to other destinations (with recorded exports of all listed source countries to these destinations in parentheses, following the destination country name, in metric tons): Bangladesh (25), Chile (47), Colombia (2,526), Egypt (479), Indonesia (1,900), Iran (360), Kenya (200), Sri Lanka (458), and Venezuela (686).

[9] Based on export statistics of Mexico; includes Colombia (2,526) and Venezuela (686).

[10] Sum of figures listed for individual destinations, including those items covered by footnote 4.

[11] Actual recorded exports of listed source countries from official trade returns unless otherwise specified.

[12] Exports reported in source other than official trade returns.

[13] Includes the following countries (quantities in parentheses, following country name, in metric tons): Belgium-Luxembourg (2,846), France (9,923), West Germany (4,023), Greece (8,363), Italy (30), Japan (1,812), Netherlands (38,290), Portugal (3,386), Singapore (2,320), Sweden (341), Thailand (17,240), United Kingdom (3,520), and United States (52,115).

## Table 59.—Major world trade in zinc ores and concentrates [1]

(Thousand metric tons of contained metal unless otherwise specified)

| Destination | Exporting region | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | North America | Latin America [2] | Western Europe [3] | Eastern Europe [4] | Africa | Asia | Oceania | Origin not reported by continent | Total |
| 1973 | | | | | | | | | |
| United States | 112.7 | 58.2 | 2.6 | -- | -- | 0.5 | 6.6 | -- | 180.6 |
| Western Europe: | | | | | | | | | |
| Belgium-Luxembourg [5] | 339.0 | 27.3 | 28.1 | -- | 5.7 | -- | -- | 88.7 | 488.8 |
| France | 42.0 | 37.2 | 42.7 | -- | 19.8 | 7.5 | 3.0 | -- | 152.2 |
| Germany, West | 148.2 | 47.8 | 92.6 | 2.7 | 5.6 | 2.0 | 4.8 | -- | 303.7 |
| United Kingdom | -- | 24.9 | 5.7 | -- | -- | -- | 20.5 | 11.2 | 62.3 |
| Other [6] | 22.8 | 19.1 | 99.5 | -- | 4.0 | .4 | 27.1 | -- | 172.9 |
| Total | 552.0 | 156.3 | 268.6 | 2.7 | 35.1 | 9.9 | 55.4 | 99.9 | 1,179.9 |
| Japan | 150.9 | 195.0 | -- | -- | -- | 43.0 | 99.9 | 8.1 | 496.9 |
| Grand total | 815.6 | 409.5 | 271.2 | 2.7 | 35.1 | 53.4 | 161.9 | 108.0 | 1,857.4 |
| 1974 | | | | | | | | | |
| United States | 147.4 | 49.8 | 3.4 | -- | -- | 12.1 | 5.1 | -- | 217.8 |
| Western Europe: | | | | | | | | | |
| Belgium-Luxembourg [7] | 279.4 | -- | 100.0 | -- | -- | -- | 34.6 | -- | 414.0 |
| France [8] | 57.0 | 55.0 | 81.0 | -- | 25.9 | 9.7 | 4.4 | 1.8 | 234.8 |
| Germany, West | 163.5 | 33.9 | 100.0 | -- | -- | 4.4 | -- | -- | 301.8 |
| United Kingdom | 2.1 | 50.0 | 9.3 | -- | 4.0 | 4.6 | 35.8 | 3.9 | 109.7 |
| Other [6] | 22.1 | 11.5 | 80.8 | -- | 1.9 | -- | 64.4 | -- | 180.7 |
| Total | 524.1 | 150.4 | 371.1 | -- | 31.8 | 18.7 | 139.2 | 5.7 | 1,241.0 |
| Japan | 29.1 | 407.1 | -- | -- | 5.6 | 57.0 | 101.9 | 2.0 | 602.7 |
| Grand total | 700.6 | 607.3 | 374.5 | -- | 37.4 | 87.8 | 246.2 | 7.7 | 2,016.5 |

[1] Imports by countries other than listed as destination are believed to be generally smaller than those listed countries.
[2] Includes Mexico.
[3] Includes Yugoslavia.
[4] Includes Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the U.S.S.R.
[5] Gross weight of ore for January through October only.
[6] The Netherlands and Norway; Norway data is gross weight of ore.
[7] Gross weight of ore for January through September only.
[8] Metal content of ore for January through September only.

Source: Monthly Bulletin of the International Lead and Zinc Study Group. Lead and Zinc Statistics, v. 14, No. 4, April 1974, p. 25; v. 15, No. 4, April 1975, p. 25.

## Table 60.—Major world trade in refined zinc
(Thousand metric tons)

| Destination | Exporting region | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | North America | Latin America [1] | Western Europe [2] | Eastern Europe [3] | Africa | Asia | Oceania | Origin not reported by continent | Total [4] |
| 1973 | | | | | | | | | |
| United States | 312.7 | 19.2 | 83.0 | 15.2 | 25.8 | 38.7 | 38.2 | 1.2 | 534.0 |
| Western Europe: | | | | | | | | | |
| Denmark | .3 | -- | 11.4 | .1 | .8 | -- | -- | -- | 12.6 |
| France | 1.3 | -- | 39.9 | 8.5 | -- | 7.6 | -- | .8 | 58.1 |
| Germany, West | 2.1 | -- | 97.6 | 4.4 | 1.2 | 1.2 | .1 | -- | 106.6 |
| Netherlands | 1.2 | -- | 17.9 | 2.5 | -- | 5.3 | -- | -- | 26.9 |
| Sweden | .5 | -- | 37.2 | 3.1 | -- | -- | -- | -- | 40.8 |
| Switzerland | -- | -- | 19.5 | 2.2 | 3.4 | 3.4 | -- | -- | 28.5 |
| United Kingdom | 59.8 | .3 | 92.4 | 27.6 | 2.3 | .9 | 34.7 | 1.7 | 219.7 |
| Total | 65.2 | .3 | 315.9 | 48.4 | 7.7 | 18.4 | 34.8 | 2.5 | 493.2 |
| Japan | 4.6 | .4 | 2.1 | 3.1 | -- | 16.3 | .5 | -- | 27.0 |
| Grand total | 382.5 | 19.9 | 401.0 | 66.7 | 33.5 | 73.4 | 73.5 | 3.7 | 1,054.2 |
| 1974 | | | | | | | | | |
| United States | 245.1 | 49.5 | 81.1 | 8.6 | 20.5 | 47.8 | 35.3 | 1.7 | 489.6 |
| Western Europe: | | | | | | | | | |
| Denmark | .1 | 1.3 | 11.3 | .1 | 1.3 | .3 | -- | -- | 14.4 |
| France | 2.4 | 3.9 | 40.0 | 6.9 | .4 | 3.6 | -- | .8 | 58.0 |
| Germany, West | .7 | 2.4 | 81.0 | 3.6 | -- | 1.4 | .5 | -- | 89.6 |
| Netherlands | .4 | .2 | 13.2 | 1.7 | .2 | 1.2 | .1 | -- | 17.0 |
| Sweden | .3 | .3 | 33.5 | .5 | -- | .4 | -- | -- | 35.0 |
| Switzerland | .2 | .2 | 17.3 | 3.4 | 2.5 | 1.6 | -- | -- | 25.2 |
| United Kingdom | 30.6 | -- | 129.8 | 9.0 | 2.4 | 2.4 | 13.9 | 7.4 | 195.5 |
| Total | 34.7 | 8.3 | 326.1 | 25.2 | 6.8 | 10.9 | 14.5 | 8.2 | 434.7 |
| Japan | 5.0 | -- | .6 | 6.0 | -- | 11.7 | .5 | -- | 23.8 |
| Grand total | 284.8 | 57.8 | 407.8 | 39.8 | 27.3 | 70.4 | 50.3 | 9.9 | 948.1 |

[1] Includes Mexico.
[2] Includes Yugoslavia.
[3] Includes Bulgaria, East Germany, Poland, and the U.S.S.R.
[4] Reported totals.

Source: Monthly Bulletin of the International Lead and Zinc Study Group. Lead and Zinc Statistics, v. 14, No. 5, May 1974, p. 25; v. 15, No. 5, May 1975, p. 25.

## Table 61.—World movement of solid fuels in 1972 and 1973 [1]

(Thousand metric tons, standard coal equivalent)

| Source area | Destination | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Market economy countries | | | | | | | | Centrally planned economy countries [7] | Destination unspecified [8] | World [9] |
| | North America [2] | Caribbean America [3] | Other America [4] | Western Europe [5] | Africa | Near East | Far East | Oceania [6] | | | |
| 1972 | | | | | | | | | | | |
| Market economy countries: | | | | | | | | | | | |
| North America [2] | 17,495 | 580 | 2,545 | 15,810 | -- | -- | 23,990 | -- | 65 | 5 | 60,485 |
| Western Europe [5] | 145 | 50 | 145 | 28,620 | 230 | -- | 260 | -- | 680 | 535 | 30,460 |
| Africa | 10 | -- | -- | 795 | 520 | -- | 110 | -- | -- | 300 | 1,740 |
| Far East | -- | 145 | 145 | -- | -- | -- | 495 | 10 | -- | 5 | 800 |
| Oceania [6] | -- | 40 | 35 | 3,160 | -- | -- | 20,285 | 115 | -- | 5 | 23,640 |
| Centrally planned economy countries [7] | -- | 105 | 225 | 27,210 | 690 | -- | 4,090 | -- | 40,230 | 385 | 72,930 |
| Total [9] | 17,650 | 925 | 3,095 | 75,605 | 1,440 | -- | 48,980 | 125 | 40,975 | 1,245 | 190,075 |
| 1973 | | | | | | | | | | | |
| Market economy countries: | | | | | | | | | | | |
| North America [2] | 16,290 | 425 | 2,560 | 13,315 | -- | -- | 28,240 | 40 | 280 | 20 | 61,170 |
| Western Europe [5] | 850 | 155 | 100 | 30,745 | 295 | -- | 240 | -- | 755 | 610 | 33,620 |
| Africa | -- | -- | -- | 1,070 | 535 | -- | 550 | -- | -- | 15 | 1,870 |
| Far East | -- | 170 | 145 | -- | -- | -- | 610 | 35 | -- | 35 | 995 |
| Oceania [6] | -- | 5 | -- | 2,840 | -- | -- | 25,790 | 30 | -- | 5 | 28,670 |
| Centrally planned economy countries [7] | 40 | 110 | 330 | 29,705 | 700 | -- | 4,665 | -- | 41,390 | 715 | 77,685 |
| Total [9] | 17,180 | 840 | 3,165 | 77,675 | 1,530 | -- | 59,555 | 110 | 42,430 | 1,420 | 204,030 |

[1] Data based on the general trade system; lignite and lignite briquets and coke are reduced to standard coal equivalent (SCE) before inclusion; bunker loadings are excluded.
[2] Bermuda, Canada, Greenland, St. Pierre, and the United States.
[3] Mexico, all areas of Central America, all islands of the Caribbean, Colombia, and Venezuela.
[4] All South America except Colombia and Venezuela.
[5] All market economy nations of Europe, and includes Yugoslavia.
[6] Refers entirely to Australia.
[7] The centrally planned nations of Europe and Asia.
[8] As reported in source.
[9] Totals reported in source; detail does not add to listed totals as shown due to (1) inclusion of quantities shipped to or received from areas not listed separately or not identified in original sources and/or (2) rounding.

Source: United Nations. World Energy Supplies 1970–73. Statistical Papers, Series J, No. 18, New York, 1975, pp. 44–49.

## Table 62.—World movement of crude petroleum in 1972 and 1973 [1]

(Thousand metric tons)

| Source area [2] | Destination: Market economy countries: North America | Caribbean America | Other America | Western Europe | Africa | Near East | Far East | Oceania | Centrally planned economy countries of Europe | World |
|---|---|---|---|---|---|---|---|---|---|---|
| 1972 | | | | | | | | | | |
| Market economy countries: | | | | | | | | | | |
| North America | 45,950 | -- | -- | -- | -- | -- | 30 | -- | -- | 45,980 |
| Caribbean America | 34,570 | 59,830 | 4,880 | 17,080 | -- | -- | 440 | -- | -- | 116,800 |
| Other America | 1,080 | 3,050 | 1,870 | 90 | -- | -- | 50 | -- | -- | 6,140 |
| Western Europe | 60 | -- | -- | 4,960 | 20 | -- | 30 | -- | -- | 5,070 |
| Africa | 30,240 | 22,030 | 4,300 | 188,770 | 2,880 | 580 | 5,240 | -- | 5,740 | 259,780 |
| Near East | 33,620 | 23,730 | 21,810 | 420,580 | 21,100 | 22,920 | 246,520 | 12,550 | 11,220 | 814,050 |
| Far East | 8,170 | 2,860 | -- | 1,080 | -- | -- | 41,690 | 710 | -- | 54,510 |
| Oceania | 40 | -- | -- | 340 | -- | -- | 170 | -- | -- | 550 |
| Centrally planned economy countries of Europe | 40 | 5,260 | -- | 23,810 | 2,330 | -- | 360 | -- | 45,190 | 76,990 |
| Total | 153,770 | 116,760 | 32,860 | 656,710 | 26,330 | 23,500 | 294,530 | 13,260 | 62,150 | 1,379,870 |
| 1973 | | | | | | | | | | |
| Market economy countries: | | | | | | | | | | |
| North America | 56,520 | -- | -- | 40 | -- | -- | 30 | -- | -- | 56,590 |
| Caribbean America | 42,180 | 56,680 | 4,140 | 13,120 | -- | -- | 460 | -- | -- | 116,580 |
| Other America | 2,870 | 5,730 | 2,670 | 900 | -- | -- | -- | -- | -- | 12,170 |
| Western Europe | -- | -- | -- | 4,820 | -- | -- | -- | -- | -- | 4,820 |
| Africa | 45,700 | 23,710 | 2,940 | 178,360 | 4,330 | 100 | 7,110 | -- | 6,540 | 268,790 |
| Near East | 49,120 | 39,870 | 32,510 | 488,350 | 25,760 | 27,580 | 271,470 | 13,070 | 16,370 | 964,100 |
| Far East | 10,080 | 2,170 | -- | 490 | -- | -- | 52,870 | 80 | -- | 65,690 |
| Oceania | -- | -- | -- | 10 | -- | -- | 220 | 50 | -- | 280 |
| Centrally planned economy countries of Europe | -- | 5,290 | -- | 26,030 | 1,610 | 150 | 1,180 | -- | 52,020 | 86,280 |
| Total | 206,470 | 133,450 | 42,260 | 712,120 | 31,700 | 27,830 | 333,340 | 13,200 | 74,930 | 1,575,300 |

[1] Data are based on general trade system.
[2] For details on countries included in each area, see footnotes to table 61.

Source: United Nations. World Energy Supplies 1970–73. Statistical Papers, Series J, No. 18, New York, 1975, pp. 64–73.

## Table 63.—Refined petroleum fuel trade in 1972 and 1973 by continental area [1]

(Million metric tons)

| Continental area [2] | Exports | | Imports | | Bunkers | |
|---|---|---|---|---|---|---|
| | 1972 | 1973 | 1972 | 1973 | 1972 | 1973 |
| Market economy countries: | | | | | | |
| North America | 11.74 | 13.78 | 127.71 | 145.94 | 17.04 | 20.01 |
| Caribbean America | 132.34 | 143.40 | 15.47 | 14.31 | 15.19 | 16.20 |
| Other America | 1.50 | .69 | 3.12 | 3.79 | 1.74 | 1.61 |
| Western Europe | 107.40 | 115.84 | 128.40 | 128.84 | 51.89 | 52.75 |
| Africa | 5.30 | 5.80 | 12.42 | 10.75 | 7.68 | 7.78 |
| Near East | 54.24 | 49.33 | 3.60 | 3.50 | 23.87 | 27.05 |
| Far East | 28.21 | 28.60 | 46.83 | 45.12 | 28.74 | 30.94 |
| Oceania | 2.25 | 3.36 | 6.36 | 7.06 | 4.71 | 4.85 |
| Centrally planned economy countries: | | | | | | |
| Centrally planned Asia | .21 | .18 | 1.42 | 1.44 | NA | NA |
| Centrally planned Europe | 37.12 | 38.22 | 6.00 | 5.99 | NA | NA |
| Total [3] | 380.30 | 399.18 | 351.43 | 366.74 | 153.90 | 164.73 |

NA Not available.
[1] Figures given are for fuel commodities only, excluding lubricants and other refinery products not normally used as energy sources. Apparent discrepancies between export, import, and bunker totals evidently result from quantities of material en route at yearend, from incomplete data, and from differing practices from country to country in the method of reporting bunkering materials.
[2] Continental areas are the same as those used in table 61 except that Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the U.S.S.R. are reported under the group term "Centrally planned Europe," while the People's Republic of China, North Korea, Mongolia, and North Vietnam are reported under the group term "Centrally planned Asia."
[3] Reported totals; may differ from sum of detail due to rounding.

Source: United Nations. World Energy Supplies 1970–73. Statistical Papers, Series J, No. 18, New York, 1975, pp. 84–95.

# The Mineral Industry of Algeria

By John L. Albright [1]

Exploration, production, processing, and marketing of numerous minerals in Algeria, the second-largest country in Africa, were carried out by the state-owned Société Nationale de Recherches et d'Exploitations Minières (SONAREM). Natural gas and petroleum developments were dominated by the state-owned Société Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures (SONATRACH). Plans were developed during the year for the construction of several cement plants, petroleum refining and storage installations, and natural gas processing and transportation facilities.

Algeria issued a contract to a Japanese firm to construct a 120,000-ton-per-year ethylene plant at Skikda, scheduled for completion during 1976. An agreement was signed by the Algerian Government and a French firm for the construction of a plant at Annaba that would process 40,000 tons of phosphate annually to produce sodium tripolyphosphate, mainly for export. Société Nationale de Sidérurgie began production at its new sulfuric acid plant at Ghazaouet, which is rated at 270 tons per day. The facility processed sulfur-dioxide-containing gases from a zinc-concentrate roaster plant.[2] Algeria signed an agreement with two Brazilian companies to create a joint construction corporation to expand the Algerian railroad system. The capacities of several railroad lines are to be increased, classification yards enlarged, and a new line approximately 425 kilometers long is to connect Ghardaia (south of Algiers) with Hassi Messaoud and Touggourt. Government revenues from the petroleum industry, including the state-owned sector, totaled approximately $900 million in 1973 and were budgeted at approximately $2 billion in 1974.[3] These revenues were expected to increase nearly 76% to $3.5 billion in 1975.

The Government embarked on its second 4-year economic plan, covering 1974 to 1977, which stressed industrial expansion. According to the plan, industrial investments will total $12 billion in 1974–77, but will not include exported-oriented projects such as enlargements to natural gas liquefaction plants, pipelines, port facilities, and tankers. Expansions of the cement, petroleum-refining, and steel industries were included in the plan. Société Nationale Algérienne de l'Electricité et du Gaz (SONELGAZ) developed plans to enlarge the electric-power-generating capability of the country to meet the demands of several new industrial complexes in eastern Algeria. New natural-gas-fueled units with a total generating capacity of 130 megawatts were added to the Annaba powerplant, raising its generating potential to 182 megawatts. In 1974, the company was installing a 125-megawatt plant at Skikda, and it finalized plans for a 135-megawatt powerplant to be built at Hassi Messaoud. In June 1974, the World Bank approved loans to Algeria totaling $157.5 million for development projects. A loan of $49 million will be used to rehabilitate the railway system, a $70 million loan will help finance the construction of liquefied natural gas (LNG) export facilities at the port of Bettioua, and a $38.5 million loan will be used to enlarge SONELGAZ's electric power system.[4]

[1] Mineral specialist, Division of Petroleum and Natural Gas.

[2] European Chemical News. Algeria Commissions New Sulphuric Acid Unit. V. 26, No. 661, Nov. 8, 1974, p. 6.

[3] Where necessary, values have been converted from Algerian dinars (DA) to U.S. dollars at the rate of DA 3,997 = US$1.00.

[4] Journal of Commerce. Loans Set for Algeria, Morocco. V. 320, No. 23212, June 4, 1974, p. 28.

## PRODUCTION

Small amounts of numerous minerals were produced in 1974, but activity in the Algerian mineral industry was dominated by the natural gas and petroleum sectors. Crude oil production in 1974 totaled 368.1 million barrels, averaging about 1 million barrels per day; this represented a decline of 32.4 million barrels, or 8.1%, from that of 1973. Production of marketable natural gas reached 211 billion cubic feet in 1974, an increase of 43.7 billion cubic feet, or 26%, over that of 1973.

**Table 1.—Algeria: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| **METALS** | | | | |
| Antimony concentrate: | | | | |
| Gross weight [e] | | 150 | 150 | 150 |
| Metal content [e] | | 60 | 60 | 64 |
| Copper concentrate: | | | | |
| Gross weight | | 1,615 | 1,502 | 1,700 |
| Metal content | | 373 | 353 | 500 |
| Iron and steel: | | | | |
| Iron ore, gross weight | thousand tons | 3,669 | 3,135 | 3,820 |
| Metal: | | | | |
| Pig iron | do | 398 | 359 | 276 |
| Crude steel | do | 65 | 78 | 250 |
| Semimanufactures | do | NA | NA | 162 |
| Lead concentrate: | | | | |
| Gross weight | | 7,470 | 6,150 | -- |
| Metal content | | 5,048 | 3,876 | 3,000 |
| Mercury | 76-pound flasks | 13,361 | 13,310 | 13,510 |
| Silver | thousand troy ounces | [e] 210 | [e] 170 | 200 |
| Zinc concentrate: | | | | |
| Gross weight | | 28,291 | 25,478 | 19,200 |
| Metal content | | 16,597 | 12,206 | 11,000 |
| **NONMETALS** | | | | |
| Barite: | | | | |
| Crude | | 60,352 | 70,756 | 53,000 |
| Powder | | 35,200 | -- | -- |
| Cement, hydraulic | thousand tons | 928 | 1,018 | 940 |
| Clays: | | | | |
| Kaolin | | 4,279 | [e] 4,500 | 10,000 |
| Bentonite | | 19,910 | 22,500 | [e] 22,500 |
| Diatomite | | 4,564 | [e] 4,600 | [e] 4,600 |
| Fertilizer materials: | | | | |
| Phosphate rock | thousand tons | 547 | 611 | 805 |
| Gypsum [2] and plasters | do | [e] 10 | [e] 10 | 48 |
| Lime, hydraulic [3] | do | 15 | 12 | 12 |
| Pyrite: | | | | |
| Gross weight | | 27,901 | 12,020 | [e] 12,000 |
| Sufur content | | 12,800 | 5,529 | [e] 5,500 |
| Salt | thousand tons | 108 | 130 | 140 |
| Sand and gravel: | | | | |
| Sand [3] | thousand cubic meters [4] | NA | NA | 60 |
| Sodium compounds, caustic soda | | 5,000 | 3,000 | NA |
| Strontium mineral, celestite, gross weight | | 1,800 | [e] 1,800 | [e] 1,800 |
| Sulfur, elemental [e] | | 20,000 | 20,000 | 20,000 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | |
| Coal | thousand tons | 12 | 13 | [e] 14 |
| Gas, natural: | | | | |
| Gross production [e] | million cubic feet | 350,000 | 360,000 | 335,000 |
| Marketed (including liquefied) | do | 119,504 | 167,391 | 211,100 |
| Natural gas liquids (condensate) | thousand 42-gallon barrels | 7,084 | 12,400 | -- |
| Petroleum: | | | | |
| Crude | do | 384,858 | 400,515 | 368,139 |
| Refinery products: | | | | |
| Gasoline | do | 5,087 | 7,399 | 6,096 |
| Jet fuel and kerosine | do | 2,086 | 2,683 | 2,920 |
| Distillate fuel oil | do | 7,064 | 8,534 | 13,724 |
| Residual fuel oil | do | 3,916 | 12,503 | 8,906 |
| Other | do | 1,391 | 6,777 | 1,168 |
| Refinery fuel and losses | do | 1,794 | 1,293 | 3,579 |
| Total | do | 21,338 | 39,189 | 36,393 |

[e] Estimate. [p] Preliminary. NA Not available.

[1] In addition to the commodities listed, secondary aluminum, secondary lead, and copper may be produced in small quantities and additional crude construction materials (crude clays and stone) presumably are produced for local consumption, but output is unreported and available information is inadequate to make reliable estimates of output levels.

[2] Partial figure production by firms employing 20 or more persons only. Total output is believed to be much higher, perhaps to the order of 175,000 tons annually.

[3] Partial figure, production by firms employing 20 or more persons only. No basis available for estimating total output.

[4] Source indicates unit of measure to be square meters, but this appears to be incorrect.

## TRADE

Shipments of crude oil dropped 6.4% from 344.8 million barrels in 1973 to 322.6 million barrels in 1974. SONATRACH continued as the leading oil exporter in the country, with 73% of the shipments; Compagnie Française des Pétroles (Algérie) (CFP), Essence et Lubrifiant de France-Enterprise de Recherches et d'Activités Pétrolières (Elf-ERAP), and Getty Petroleum Co. were the other petroleum exporters. West Germany continued to be SONATRACH's best customer, purchasing 65.5 million barrels of oil, or 27% of the 235 million barrels of oil exported by the company. Crude oil shipments to the United States were SONATRACH's second largest at 62.6 million barrels, an increase of nearly 53% from those of 1973. More than one-half of the crude oil exported by the firm went to European refiners, and most of the remainder went to the United States and North Africa.

Shipments of LNG to France were interrupted early in 1974 by equipment failures at SONATRACH's Skikda plant. SONAREM continued as an important world exporter of mercury, and it supplied about 20% of the U.S. mercury imports.

## Table 2.—Algeria: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, all forms | 138 | 141 | France 73; Belgium-Luxembourg 68. |
| Copper: | | | |
| Ore and concentrate | 1,100 | 961 | All to Czechoslovakia. |
| Metal including alloys, all forms | 1,714 | 1,863 | France 1,175; Spain 458. |
| Iron and steel: | | | |
| Ore and concentrate thousand tons | 2,388 | 1,255 | Romania 679; Belgium-Luxembourg 212; Italy 180. |
| Metal: | | | |
| Pig iron, ferroalloys, similar materials | 274,114 | 131,211 | Italy 45,410; People's Republic of China 31,600; Spain 27,767. |
| Semimanufactures | 734 | 6,729 | Italy 3,933; France 1,460; Belgium-Luxembourg 1,329. |
| Lead: | | | |
| Ore and concentrate | 5,658 | 5,085 | Tunisia 2,385; Spain 1,500; France 1,200. |
| Metal, including alloys, scrap | -- | 95 | All to France. |
| Magnesium metal, all forms | 11 | 7 | All to Belgium-Luxembourg. |
| Mercury | NA | 534 | United States 394; Japan 72. |
| Nickel metal including alloys and scrap | 67 | 34 | All to Belgium-Luxembourg. |
| Tin, scrap long tons | -- | 68 | All to France. |
| Zinc: | | | |
| Ore and concentrate | 28,052 | 7,677 | Italy 4,985; Bulgaria 1,892; France 800. |
| Metal including alloys: | | | |
| Scrap | 640 | 648 | All to France. |
| Semimanufactures | 12 | 8 | Do. |
| Other ore and concentrate, n.e.s | 820 | -- | |
| NONMETALS | | | |
| Abrasives, grinding and polishing wheels and stones kilograms | r 653 | 12 | All to West Germany. |
| Clays and clay products (including all nonrefractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 3,912 | 4,278 | Oman 2,013; Nigeria 890; Spain 800. |
| Kaolin | 1,682 | 1,028 | People's Republic of China 617; Spain 400. |
| Other | 6,500 | 250 | All to Denmark. |
| Products: Nonrefractory | | 1 | All to Belgium-Luxembourg. |
| Diatomite and other infusorial earth | 3,431 | 6,247 | France 1,816; Italy 1,573; United Kingdom 1,353. |
| Fertilizer materials: | | | |
| Crude, phosphatic | 315,863 | 218,455 | France 68,390; Czechoslovakia 60,760; Poland 44,205. |
| Ammonia | -- | 71,052 | Spain 45,200; Italy 8,966; Greece 7,447. |
| Pyrites, unroasted | 37,230 | 24,852 | All to Egypt. |
| Salt | 32,150 | 69,685 | France 20,000; Spain 16,260; Morocco 10,270. |
| Stone, sand and gravel: | | | |
| Dimension stone | -- | 4 | All to France. |
| Gravel and crushed stone kilograms | -- | 700 | All to West Germany. |
| Sand, excluding metal bearing | -- | 8 | All to Austria. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Gas, natural, liquefied million cubic feet | (1) | 93,825 | United Kingdom 52,039; France 39,177. |
| Hydrogen, helium and rare gases | NA | 452 | All to France. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 363,133 | 352,501 | West Germany 91,903; France 80,916; United States 46,932. |
| Refinery products: | | | |
| Gasoline do | 849 | 4,948 | Netherlands 1,735; United States 1,342; Spain 624. |
| Jet fuel and gasoline do | -- | 567 | United Kingdom 424; Netherlands 143. |
| Distillate fuel oil do | 1 2 306 | 2,680 | Italy 1,047; Netherlands 1,032; West Germany 374. |
| Residual fuel oil do | 1 2 2,098 | 6,177 | United States 4,965; Venezuela 786. |
| Other do | 1 2 425 | 147 | All to West Germany. |
| Total do | 3,678 | 14,519 | |

r Revised. NA Not available.

1 Official data not available owing to printing error in official trade returns.

2 Data from U.S. Bureau of Mines, International Petroleum Annual, 1972.

## Table 3.—Algeria: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Oxide and hydroxide | 145 | 81 | Mainly from France. |
| Metal including alloys, all forms | 4,440 | 5,260 | France 2,376; Italy 765; West Germany 584. |
| Antimony metal including alloys, all forms[1] | 46 | 41 | Mainly from Belgium-Luxembourg. |
| Arsenic oxide and acid | 30 | 10 | Mainly from France. |
| Cadmium metal including alloys, all forms[1] kilograms | -- | 520 | Do. |
| Chromium: Oxide and hydroxide | 16 | 16 | West Germany 7; France 5; Italy 4. |
| Cobalt, oxides and hydroxides kilograms | r 2 | 192 | Mainly from France. |
| Copper: | | | |
| Copper sulfate | 1,038 | 117 | Mainly from West Germany. |
| Metal including alloys, all forms | 5,790 | 8,346 | West Germany 4,634; Peru 1,079; Italy 757. |
| Iron and steel: | | | |
| Ore and concentrate | r 40 | 125,630 | Mauritania 80,582; Tunisia 45,046. |
| Roasted pyrite | 10 | 11 | All from Morocco. |
| Metal: | | | |
| Scrap | 38 | 30 | Mainly from France. |
| Pig iron, ferroalloys, similar materials | 2,717 | 9,104 | West Germany 5,734; Norway 1,750. |
| Steel, primary forms | 28,343 | 18,251 | West Germany 8,019; U.S.S.R. 4,978; Canada 3,015. |
| Semimanufactures: | | | |
| Rails and accessories | 30,683 | 14,352 | Spain 5,010; Austria 4,232; France 4,028. |
| Tubes, pipes, fittings | 64,015 | 72,004 | France 27,401; Argentina 13,015; Italy 9,814. |
| Other | 374,005 | 524,382 | Belgium-Luxembourg 113,834; Italy 108,429; West Germany 82,887. |
| Lead: | | | |
| Ore and concentrate | 126 | 5 | All from Morocco. |
| Oxides | 727 | 879 | Mainly from France. |
| Metal including alloys, all forms | 3,011 | 4,027 | West Germany 1,696; Tunisia 835; France 778. |
| Magnesium metal including alloys, all forms | 11 | (2) | All from West Germany. |
| Manganese oxides | 3 | (2) | All from France and West Germany. |
| Mercury 76-pound flasks | 102 | 12 | West Germany 8; France 2. |
| Nickel metal including alloys, all forms | 36 | 71 | Czechoslovakia 28; West Germany 26; France 12. |
| Platinum-group metals and silver including alloys: | | | |
| Platinum group troy ounces | 579 | 515 | Mainly from United Kingdom. |
| Silver do | 32,092 | 237,803 | Spain 106,097; France 83,174; Switzerland 20,586. |
| Rare-earth metals: | | | |
| Oxides kilograms | (2) | 407 | Italy 305; Switzerland 45. |
| Metal including alloys do | (2) | 185 | Mainly from France. |
| Tin metal including alloys, all forms long tons | 190 | 101 | Malaysia 31; United Kingdom 19; Belgium-Luxembourg 18. |
| Titanium: | | | |
| Ore and concentrate | 356 | 107 | All from Australia. |
| Oxide | 1,087 | 1,630 | West Germany 725; Italy 455; France 180. |
| Metal including alloys, all forms kilograms | 24 | 144 | West Germany 61; United Kingdom 48; France 35. |
| Tungsten metal including alloys, all forms[1] do | (2) | 1,734 | Mainly from United Kingdom. |
| Zinc: | | | |
| Oxide | 184 | 327 | France 84; Italy 59; Poland 56. |
| Metal including alloys, all forms | 1,086 | 4,642 | Belgium-Luxembourg 1,621; West Germany 1,047; France 802. |
| Other: | | | |
| Ore and concentrate | | 54 | All from Australia. |
| Oxides, hydroxides, peroxides, n.e.s | 84 | 111 | Mainly from France. |
| Metals including alloys, all forms: | | | |
| Metalloids | 35 | 56 | Norway 39; Sweden 11; West Germany 5. |
| Pyrophoric alloys kilograms | 39 | 482 | All from United Kingdom. |
| Zirconium, ore and concentrate | r 14 | 2 | All from Australia. |

See footnotes at end of table.

## Table 3.—Algeria: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 37,632 | 39,665 | Mainly from Italy. |
| Grinding and polishing wheels and stones | r 480 | 341 | France 136; Switzerland 68; Italy 64. |
| Dust and powder of precious and semiprecious stones - kilograms | r (2) | 2 | Mainly from France. |
| Asbestos | 3,414 | 2,449 | Canada 1,404; Botswana 1,005. |
| Barite and witherite | 2,971 | 31 | France 22; Belgium-Luxembourg 9. |
| Boron materials: | | | |
| Crude natural borates | 10 | 8 | Mainly from Belgium-Luxembourg. |
| Oxide and acid | 5 | 152 | Mainly from Italy. |
| Bromine - kilograms | 318 | 15 | West Germany 10; Switzerland 5. |
| Cement | 814,468 | 1,123,065 | Spain 445,545; U.S.S.R. 289,683; France 172,274. |
| Chalk | 12,604 | 8,336 | Mainly from France. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Kaolin | 5,867 | 7,500 | Mainly from United Kingdom. |
| Other | 3,178 | 2,077 | Morocco 1,011; France 510; West Germany 402. |
| Products: | | | |
| Refractory (including nonclay brick) | 14,853 | 17,287 | West Germany 5,887; France 5,223; Italy 3,444. |
| Nonrefractory | 6,858 | 2,688 | Spain 1,086; West Germany 731; France 481. |
| Diamond, industrial - value | r $3,306 | $2,135 | Mainly from West Germany. |
| Diatomite and other infusorial earth | 19 | 19 | United Kingdom 14; Italy 2; Belgium-Luxembourg 2. |
| Feldspar | 96 | 44 | All from France. |
| Fertilizer materials: | | | |
| Crude and manufactured: | | | |
| Nitrogenous | r 191,023 | 59,400 | Bulgaria 19,250; Romania 18,216; Belgium-Luxembourg 14,300. |
| Phosphatic | 139,235 | 105,401 | United States 38,020; Spain 8,930; Tunisia 5,000. |
| Potassic | 79,233 | 47,684 | Spain 38,440; Italy 9,240. |
| Other including mixed | 3,887 | 40,730 | Mainly from United States. |
| Ammonia | 7,609 | 3,350 | France 1,670; Netherlands 1,664. |
| Fluorspar | 19 | 135 | Mainly from Tunisia. |
| Graphite, natural | 15 | 2 | All from France. |
| Gypsum and plasters | (2) | 241 | France 200; Italy 30. |
| Iodine - kilograms | 1,000 | 99 | West Germany 61; France 25; Switzerland 13. |
| Lime | 3,680 | 2,712 | France 1,697; Tunisia 719; Spain 296. |
| Magnesite | 441 | 1,578 | France 600; Greece 596; Austria 310. |
| Mica, crude, including splittings and waste | -- | 442 | All from United States. |
| Pigments, mineral: | | | |
| Natural, crude | 598 | 380 | France 326; Belgium-Luxembourg 54. |
| Iron oxides, processed | 468 | 379 | West Germany 295; France 51. |
| Quartz crystal - kilograms | 4 | 4 | Mainly from United States. |
| Salt and brine | 8 | 3 | Mainly from Switzerland. |
| Sodium and potassium compounds, n.e.s | 13,631 | 14,080 | Italy 8,455; France 2,221; Netherlands 1,600. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 317 | 323 | Mainly from Italy. |
| Worked | 73 | 20 | France 10; Italy 6; Spain 4. |
| Dolomite, chiefly refractory grade | 453 | 180 | Italy 130; France 50. |
| Gravel and crushed rock | 31,434 | 16,796 | Mainly from Italy. |
| Quartz and quartzite | 64 | 171 | Belgium-Luxembourg 150; France 20. |
| Sand, excluding metal bearing | 23 | 967 | France 344; United States 317; Netherlands 114. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 56,989 | 93,692 | All from Poland. |
| Colloidal | 3,601 | 550 | All from France. |
| Sulfur dioxide | 168 | 251 | France 157; West Germany 93. |
| Sulfuric acid | 1,618 | 8,243 | Mainly from United Kingdom. |
| Talc, steatite, soapstone, pyrophyllite | 2,630 | 2,983 | Mainly from France. |

See footnotes at end of table.

Table 3.—Algeria: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Vermiculite, perlite, chlorite | 354 | (2) | Mainly from United Kingdom. |
| Other | 243 | 627 | West Germany 453; France 82. |
| Oxides and hydroxides of magnesium, strontium, barium | 56 | 3 | Mainly from France. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 5,446 | 10,067 | France 7,763; Spain 1,099; Austria 1,043. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 9 | 40 | All from Netherlands. |
| Carbon black | 1,393 | 1,830 | France 697; Spain 570; Netherlands 206. |
| Coal, all grades, including briquets | 58,558 | 59,523 | U.S.S.R. 28,786; Romania 11,283; West Germany 9,634. |
| Coke and semicoke | 239,055 | 260,235 | U.S.S.R. 122,318; Italy 119,858. |
| Hydrogen, helium, rare gases | 32 | 34 | France 22; Morocco 10. |
| Peat | 5 | 5 | All from France. |
| Petroleum: | | | |
| Crude - thousand 42-gallon barrels | -- | (2) | Do. |
| Refinery products: | | | |
| Gasoline do | 46 | 27 | Mainly from Netherlands. |
| Jet fuel and kerosine do | 1 | 1 | Mainly from France. |
| Distillate fuel oil do | 107 | 72 | Mainly from Spain. |
| Residual fuel oil do | 103 | 72 | All from Spain. |
| Lubricants do | 469 | 476 | Italy 270; United Kingdom 200. |
| Other: | | | |
| Liquefied petroleum gas do | 955 | 724 | Italy 577; France 131. |
| White spirit do | 18 | 24 | Mainly from Netherlands. |
| Petroleum jelly and wax do | 30 | 46 | West Germany 33; East Germany 6; Poland 6. |
| Asphalt and bitumen do | 515 | 285 | Spain 179; France 70. |
| Petroleum coke and flux do | 10 | 6 | Mainly from France. |
| Unspecified do | 8 | 47 | Do. |
| Total do | 2,262 | 1,780 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 1,090 | 2,978 | France 808; Netherlands 666; United Kingdom 508. |

r Revised.
1 May include some manufactures not normally listed among mineral commodities.
2 Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Iron Ore.**—The Government revealed plans to exploit the Gara Djebilet iron ore deposits in southwest Algeria and construct a 1,100-kilometer railroad from that area to the Mediterranean coast. Ore production at Gara Djebilet may reach 10 to 12 million tons per year in the near future.[5]

**Lead and Zinc.**—The electrolytic zinc plant near Ghazaouet, under construction since 1970, was readied for service during the fourth quarter of 1974. The annual production rate of 40,000 tons of zinc is expected to double after planned expansions. El Abed zinc ore will be processed at the Ghazaouet plant, and approximately 80% of the zinc will be exported.

**Uranium.**—SONAREM negotiated an agreement with Uranerzbergbau GmbH of West Germany for assistance in the mining and marketing of uranium. Details of the agreement were not publicized.

### NONMETALS

**Cement.**—Negotiations were carried out and contracts signed with foreign engineering firms for the construction of three cement plants along the northern coast. Each of the new plants will have an annual production capacity of 1 million tons. A West German company will build one of the plants at 'Aïn el Kebira (near Sétif), a Japanese firm will construct a similar plant at El Asnam (near Algiers), and an unidentified foreign firm will build the third plant at Zahana (near Oran). Construc-

[5] Mining Journal. Iron Ore Railway for Algeria. V. 283, No. 7268, Dec. 6, 1974, pp. 491–492.

tion of the 1-million-ton-per-year plant at Meftah, near Algiers, continued and was scheduled for completion in 1975.

**Fertilizer Materials.**—SONATRACH developed plans to build an ammonium nitrate and nitric acid production complex at Annaba to be rated at 100 tons per day of ammonium nitrate and 800 tons per day of nitric acid. Completion was scheduled for yearend 1976.[6]

## MINERAL FUELS

**Natural Gas.**—In 1974, the total natural gas reserves in Algeria were estimated at 250 trillion cubic feet, which included nearly 99 trillion cubic feet of proved reserves, 130 trillion cubic feet of probable reserves, and 21 trillion cubic feet of possible reserves. Additional processing and transportation facilities were planned, but the industry encountered intermittent operating problems with its gas-processing equipment. Equipment failures plagued SONATRACH's LNG plant at Skikda during the first half of 1974; shipments of LNG to France, the major customer of the plant, were reduced until production was restored in June. Gas shipments to the United States were also curtailed, and a planned increase in exports to the United States, scheduled to begin at the end of 1974, was delayed until the second half of 1975.[7] Cie. Nationale Algérienne de Navigation ordered five LNG tankers, each with a capacity of 125,000 cubic meters (4.4 million cubic feet), at a total value of about $500 million from French shipyards. Construction of the vessels was scheduled for completion in 1978.

Construction was completed at a second natural gas reinjection plant at Hassi Messauod, which included two high-pressure centrifugal compressors driven by gas turbines. SONATRACH issued a contract valued at $56 million to an Italian firm for the installation of three additional gas reinjection plants at Hassi Messaoud.

SONATRACH signed an $850 million contract with an international consortium for the construction of a huge plant for LNG and natural gas liquids at Bettioua, several kilometers east of Arzew. The consortium included Chemical Construction Corp. (United States), Creusot Loire Entreprises (France), Mannesmann-Export Aktienge-Sellschaft (West Germany), Sybetra (Belgium), Traction et Electricité (Belgium), and Vöest-Alpine (Austria). Each year, the plant will liquefy 547 billion cubic feet of natural gas for export and produce 450,000 tons of butane and 480,000 tons of propane. The LNG will be exported from the new port of Bettioua to France and Italy. Overall cost of the project will be approximately $2.3 billion, including the plant, port facilities, and twin, large-diameter natural gas pipelines from the Hassi R'Mel gasfield in the Sahara Desert to the coastal processing complex.[8]

A consortium of 14 Japanese companies proposed the construction of a methanol plant in Algeria rated at 20,000 to 30,000 tons daily. The output would be shipped to Japan for use as industrial fuel.

During the year, SONATRACH negotiated an agreement with Empresa Nacional del Gas of Spain and Gaz de France, establishing a joint company, Société d'Etudes pour le Gazoduc de la Mediterranée-Ouest, to plan a 1,300-kilometer natural gas trunkline from the Hassi R'Mel field through the Straits of Gibraltar to southern Spain. Algeria also signed an agreement with the Spanish gas company for the annual delivery of 159 billion cubic feet of LNG to Spain for 20 years.[9] Spain began taking delivery of Algerian LNG in February 1974 under the terms of a 15-year contract signed in 1972 between Gas Natural, S.A. and SONATRACH. In June, SONATRACH signed contracts with Ruhrgas A.G. and Salzgitter Ferngas GmbH of West Germany for the sale of nearly 212 billion cubic feet of LNG annually over 20 years beginning in 1979.

SAIPEM, a subsidiary of the Italian firm, Ente Nazionale Idrocarburi, and SONATRACH established a company called Société Algérienne de Construction Industriel et Pétrolière (ALCIP) to build natural gas and petroleum facilities in Algeria. ALCIP will be owned 51% by SONATRACH and 49% by SAIPEM; its first project will be a 507-kilometer, 102-centimeter-diameter gasline from Hassi R'Mel to Arzew.

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[6] European Chemical News. Krebs Wins North African PVC and Fertilizer Orders. V. 25, No. 652, Sept. 6, 1974, p. 14.

[7] Oil Daily. Northeast Lost 5% of Potential '74 Gas Supplies. No. 5787, Dec. 12, 1974, p. 1.

[8] Petroleum Economist. $850 Million LNG Plant. V. 41, No. 10, October 1974, p. 379.

[9] European Chemical News. New Algeria-France-Spain Gas Company. V. 25, No. 628, Mar. 22, 1974, p. 11.

SONATRACH awarded a contract to a Canadian firm for engineering the 595-kilometer Algerian section of the proposed 2,655-kilometer gas pipeline from Hassi R'Mel to La Spezia, Italy. The Algerian section will run north-eastward to the Tunisian border from the Hassi R'Mel gasfield. The Algerian firm also issued a contract to a British firm for the construction of compressor stations for the 40-inch-diameter Hassi R'Mel to Skikda gasline. The new stations will boost the capacity of the pipline from 324 billion to 448 billion cubic feet per year.

**Petroleum.**—In 1974, SONATRACH negotiated joint 51%–49% oil exploration agreements with several large foreign companies providing for the Algerians to hold the controlling shares. Amoco International Oil Co. and SONATRACH signed a joint-venture agreement for the exploration of 17,000 square kilometers in the Sahara Desert. Amoco will spend $33.5 million over a 2-year period exploring near Hassi Messaoud and Illizi.[10]

Brazil's Petrobrás Internacional S.A. (Braspetro) signed a joint exploration arrangement with SONATRACH, involving an investment of about $39 million on a 17,500-square-kilometer tract near Biskra.

Three West German companies, Union Rheinische Braukohlen Kraftstoff A.G., Veba-Chemie A.G., and Wintershall A.G., formed a consortium and signed an oil exploration and supply agreement with SONATRACH. Deutsche Erdölversorgungsgellschaft mbH (Deminex) will explore in the 19,700-square-kilometer concession for the consortium. If oil is found, the West German firms will be entitled to 49% of the production for 12 years. Early in 1974, Algeria signed oil exploration agreements with three French companies. SONATRACH settled the financial arrangement with Elf-ERAP for the 1971 Algerian nationalization of the company's operations and reached an agreement with the French group on a prospecting partnership covering 8,500 square kilometers of territory.[11] Elf-ERAP will spend $31 million exploring for oil near El Oued-Biskra and Gassi El Agreb according to the terms of the agreement. A similar 51%–49% oil exploration agreement covering 8,440 square kilometers was signed with the Société Nationale des Pétroles d'Aquitaine of France, and SONATRACH signed a 51%–49% agreement with CFP. CFP will invest $15 million exploring some 10,000 square kilometers onshore and about $3.5 million exploring offshore areas. During the year, the French firm began drilling about 11 kilometers offshore, near Algiers.

Hispanica de Petroleos, S.A. (Hispanoil), of Spain reported an oil discovery on its Kef el Argoub permit in southern Algeria, where it is committed to spend $33.5 million on exploration over a 4-year period.[12] The discovery well flowed 1,100 barrels per day of 43.4° API crude oil with a low sulfur content. Hispanoil also found oil at El Meharis, where its well flowed 44° API oil at 2,200 barrels per day.

During 1974, 123 wells were drilled (16 dry, 9 natural gas, 46 oil, and 52 service) for a total of 237,500 meters, a decrease of 13,860 meters from that of 1973. Only three discovery wells were reported, two by Hispanoil and one by CFP.[13] The French discovery was in the Illizi Basin, but other details were not released.

The posted price of SONATRACH's crude oil was set at $16.216 per barrel, effective January 1, 1974. This was more than four times higher than the January 1, 1973, price of $3.953 per barrel, and 75% higher than the fourth quarter 1973 posted price of $9.25 per barrel. The selling price per barrel was set at $14 in January 1974 (compared with $3.00 in January 1973), fell to $13 in July, and was further reduced to $12.30 for the fourth quarter of 1974.

The Italian firm Snam Progetti S.p.A. signed a $300 million contract with SONATRACH for the construction of a 300,000-barrel-per-day petroleum refinery at Skikda. The Italian company will also construct a storage depot for refined products at El Khroub about 20 kilometers south of Constantine, to be linked to the refinery by two pipelines. Snam Progetti S.p.A. previously designed the 86-centimeter crude oil pipeline from the Haoud El Hamra oilfield to Skikda.

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[10] Middle East Economic Survey (Beirut, Lebanon). SONATRACH Signs Joint Venture with AMOCO. V. 17, No. 51, Oct. 11, 1974, pp. 8–9.
[11] The Petroleum Economist. Algeria. V. 41, No. 2, February 1974, p. 73.
[12] Oil and Gas Journal. Hispanoil Scores Algerian Oil Strike. V. 73, No. 7, Feb. 17, 1975, p. 47.
[13] World Oil. Algeria. V. 181, No. 3, Aug. 15, 1975, pp. 145–146.

# The Mineral Industry of Angola, Mozambique, and Guinea Bissau

By Janice L. W. Jolly [1]

## ANGOLA

The mineral industry of Angola made a significant contribution to the economy in 1974. Both production and revenues earned from the mineral industry in 1974 increased markedly over those of 1973. Exports (including all products) were valued at $652 million [2] in the first half of 1974, compared with $298 million for exports in the same 1973 period, while imports for the first half of 1974 were valued at $307 million and for the comparable 1973 period at $222 million. The increase in export value in 1974 over 1973 was mostly due to petroleum, but significant increases also occurred in iron ore and diamonds. Following the events of April 25, 1974, in Portugal, however, and the announcement of expected independence for Angola, productivity in general showed a decrease of about 30%. Some activities, such as civil construction reportedly [3] showed a reduction in excess of 50%. By yearend 1974, several factors pointed to marked recession: the abnormal situation in the ports, the swift rise of inflation, and near paralysis of investments in productive activities. Industrial enterprises had seen their labor forces reduced to less than a third and others idled their machines. The Credit and Securities Inspection of Angola published notices in October and November 1974 temporarily suspending money transfers, with only a few exceptions being made.

The fourth development plan period (1974–79) started in 1974 with a budget of $165.2 million, which represented 17.8% of the total State budget. In 1975 over $231.3 million was expected to be spent on the development plan, representing 20% of the total budget for the year of $1,073.8 million. For the first time, ordinary receipts (notably petroleum) were expected to defray the greater part of these expenditures. A 12.5% royalty was collected on petroleum production, and the tax on profits of petroleum producers was 50%. These were expected to be raised in 1975 to 16.67% (royalties) and 60% (profit tax). In 1974, 72.4% of all financing came from loans and 27.6% from Angola's own funds. The 1975 program provides that Angola's funds will cover 63.3% of all expenditures, with the rest from loans. Increased attention was to be paid to infrastructure construction, such as roads, maritime shipping, and aviation. In addition the plan also called for investments in manufacturing (import substitution), mining, and metallurgy.

Carbonatites were the subject of a recent [4] report by the Angolan Department of Geology and Mines. Carbonatites in the Chivira-Bonga, Monte Verde, Coola, Bailundo, Longonjo, Virulundo, Chitado, Capula, Cuacra, Chinga, Catanda, Capunda, Morro Vermelho and Lupongola areas were described. The possibility of using these as sources of raw materials for rare earths, uranium, cement, soda, potash, ceramic,

[1] Physical scientist, Division of Ferrous Metals.
[2] Where necessary, values have been converted from Angola escudos (A. Esc.) to U.S. dollars at the rate of A. Esc. = US$0.0413.
[3] Actualidade Economica (Luanda). Angolan Trade Balance for First Quarter 1974. Sept. 26, 1974, p. 19.
[4] Lapio-Loureiro F. E. De Vries. Carbonatitos de Angola (Carbonatites of Angola). Mem. Trav. Angola, No. 11, 1973, 242 pp.

and ornamentation industries was visualized. Two publications listing work done by the Geologic Division between 1960 and 1973 were also recently issued [5] and complement the bibliography published in 1970.

General Mining and Finance Corp. Ltd. announced cessation of all prospecting operations in Angola at the end of 1974. General Mining had been exploring around Nova Lisboa where it had found deposits of lead and zinc.

In the 10 years between 1963 and 1973, total production of electric energy increased from 221 to 984 million kilowatt hours, at an average yearly rate of 16.1%. Angola consumed 860 million kilowatt hours in 1974. In 1973 production came from 1,472 thermal and 70 hydroelectric generating plants. Hydroelectric generating stations in Angola were expected to have a total capacity of 343 megawatts in 1974. Two more generators were under construction; one at the Quiminha dam on the Bengo (25 megawatts) and the other at the Chigala dam (5 megawatts) built for Companhia de Diamantes de Angola (DIAMANG). In Moçâmedes two diesel units of 5.5 megawatts each were finished in 1974. The extension of the Malembo plant, functioning with natural gas, was to be finished in the third month of 1975.[6] A hydroelectric powerstation was also being built as part of the Cunene River Scheme. In 1974 a contract was signed by Hydrodine, the electrical and mechanical contracting subsidiary of the South African Murray and Stewart Co. A contract was signed with Voëst Alpine A/G for the installation of generators (3,100 megawatts each). Water turbines and generators for the station are being built on the Cunene River on the northern border of the Territory of South-West Africa, adjoining Angola. Hydrodine, based in the Territory of South-West Africa, expected to start work in mid-1975. The electrical and mechanical side of the contract was reported as worth more than $14.7 million.

## PRODUCTION AND TRADE

The total value of mineral production (excluding refinery production) was $821.2 million in 1974, compared with the estimated $402.7 million for 1973. Crude oil was the principal mineral exported in 1974, followed by iron ore and diamonds. After raising the price of crude oil, Angola exported a record total for an estimated value of $675 million, compared with an estimated $235 million [7] for 1973. Including the Cabinda oil fields, which produce 99.2% of Angola's oil, Angola recorded an average daily production of approximately 169,000 barrels per day in 1974.

The extraction and processing industries generally registered output increases accompanied by price rises in the first half of 1974. However, there were some exceptions. For instance, granite production dropped from 4,245 cubic meters produced in the first 6 months of 1973 to 3,193 cubic meters in the equivalent 1974 period, and kaolin dropped from 245 tons in the first 6 months of 1973 to 117 tons in the same 1974 period. No manganese or copper was registered in the first half of 1974. Manganese production has not been reported since October 1973, and is presumed to have ceased. Production of iron ore went up from 2.3 million tons worth $24.2 million in the first 6 months of 1973 to 2.9 million tons worth $26.2 million for the same period in 1974, and diamonds were up from 930,972 carats worth $37 million in the first 6 months of 1973 to 948,639 carats worth $41.2 million in the same period of 1974. Total diamond output for 1974 was 1.93 million carats, 8% less than 1973. Half again this amount of diamond output was also probably sold illegally. Reasonable increases also occurred in marine salt, asphaltic rock, and chalk.[8]

In 1974 a dramatic doubling of exports from Angola to the U.S. occurred, notably owing to increased crude petroleum shipments. Cabinda supplied about 2.25% of the total U.S. oil imports. Imports into Angola from the U.S. also increased by about 76% to $50.3 million through October. Canada, Japan, and West Germany also imported oil from Angola and, along with the United States and Portugal, accounted for all but 1% of Gulf Oil Corp.'s shipments of Cabinda crude. Portugal's con-

[5] Avila, Ramalha, R. R. Lista de publicacoes (List of Publications). Inst. Invest. Cient. Angola, Div. Geol., Angola 1973, 10 pp.
Cunha Ferro, Ribeiro M. da, and Silva, A.T.S. Ferreira da. Bibliografia geologica de Angola (Geologic Bibliography of Angola). Serv. Geol. Minas, Angola, 1973, 28 pp.

[6] Industries et Travaux d'Outre-Mer (Paris). Angola. V. 22, No. 253, December 1974, p. 1131 (in French).

[7] Banco De Angola (Luanda Angola). 1973 Exports. Boletim Trimestral No. 65, January to March 1975, pp. 15–16 (in Portuguese).

[8] Actualidade Economica (Luanda). Industrial Production, First Half 1974. Jan. 19, 1975, pp. 20–23 (in Portuguese).

sumption of Angola's oil dropped during 1974 and shipments to Japan were concentrated into the last 3 months of the year.

Trade expansion occurred during the greater part of 1974 despite political uncertainties, strikes, declines in productivity, and departing numbers of workers and entrepreneurs. Even so, by the end of the year, these factors all served to reduce the amount of merchandise handled by the ports of Lobito and Luanda. It was estimated that port calls by navigation companies were reduced by about 30% relative to 1973. Freight rates were also raised 30% on September 9, 1974, reflecting difficulties encountered. Petroleum remained the only export mineral commodity that was unaffected by the deteriorating port conditions. A force majeure was declared by Angola National Steelworks at yearend when it canceled steel scrap purchases because its steel market had declined, tighter import license restrictions had been imposed, and it was having difficulties with its work force.

Detailed trade data for 1973 and 1974 were not available at the time that this chapter was written. The latest trade statistics available are those for 1972, and are contained in the 1973 Minerals Yearbook chapter.

**Table 1.—Angola: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| METALS | | | |
| Beryllium, beryl, gross weight | 175 | 115 | e 100 |
| Gold, mine output, metal content: | | | |
| Placer ---- troy ounces | 39 | NA | NA |
| Vein ---- do | 1,665 | NA | NA |
| Total ---- do | 1,704 | e 2,000 | e 2,000 |
| Iron ore and concentrate, gross weight ---- thousand tons | 4,831 | 6,052 | e 5,170 |
| Manganese ore and concentrate, gross weight | 37,700 | 4,682 | -- |
| NONMETALS | | | |
| Cement, hydraulic ---- thousand tons | 624 | 768 | 812 |
| Clays, kaolin | 854 | 667 | e 550 |
| Diamond: | | | |
| Gem ---- thousand carats | 1,616 | 1,594 | e 1,448 |
| Industrial ---- do | 539 | 531 | e 482 |
| Total ---- do | 2,155 | 2,125 | e 1,930 |
| Gypsum | 83,376 | 46,655 | e 40,000 |
| Salt | 125,302 | 96,717 | e 97,000 |
| Stone: | | | |
| Dimension: | | | |
| Granite blocks ---- cubic meters | 8,610 | 7,578 | e 6,000 |
| Marble blocks ---- do | 1,623 | 1,201 | e 1,000 |
| Other, limestone | 713,700 | NA | NA |
| Talc | 70 | e 100 | e 100 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 55,535 | 49,637 | e 40,000 |
| Natural gas: | | | |
| Gross production ---- million cubic feet | 31,393 | e 36,000 | e 37,500 |
| Marketable production e ---- do | 2,000 | 2,300 | 2,400 |
| Petroleum: | | | |
| Crude ---- thousand 42-gallon barrels | 50,932 | 58,852 | 61,392 |
| Refinery products: | | | |
| Gasoline ---- do | 296 | 542 | 546 |
| Jet fuel ---- do | 441 | 556 | 563 |
| Kerosine ---- do | | 157 | 157 |
| Distillate fuel oil ---- do | 559 | 778 | 785 |
| Residual fuel oil ---- do | 1,907 | 2,895 | 2,934 |
| Other ---- do | 158 | 98 | 97 |
| Refinery fuel and losses ---- do | 202 | 302 | 332 |
| Total ---- do | 3,563 | 5,338 | 5,414 |

e Estimate. p Preliminary. NA Not available.
[1] In addition to the commodities listed, a variety of crude construction materials such as clays, sand, gravel, and broken stone presumably is produced for local consumption, but information is inadequate to make reliable estimates of output levels.

## COMMODITY REVIEW

**Metals.**—*Copper.*—The Tetelo copper deposits near Uíge in the north of Angola reportedly started production in 1973 with 20,000 tons of concentrates.[9] The mine was managed by Sociedade de Investigacoes Mineiras (SIMEIRA). The copper deposits of the English mine near Benguela were expected to be exploited near yearend 1975. Deposits located to the east of Novo Redondo in the proximity of Binga cataract (Cachoeiras Region) were also reportedly[10] attracting attention of such companies as DIAMANG, Companhia Mineira do Lobito, S.A.R.L. (CML), the U.S. Bethlehem Steel Corp. and Anglo American Corp. of South Africa, Ltd. Observations on the copper occurrences in the Chachoeiras Region of the Cuanza Basin were made in a recent report[11] by the French Bureau de Récherches Géologique et Minère (BRGM). The mineral concentrations were distributed in lagoonal-deltaic sediments at the edge of the continent, consisting of conglomerates, sandstones, and siltstones. Remobilization occurred with tectonic movement after consolidation. They are associated with carbonate cement as well as well-formed detrital elements. The stratiform mineralization at Binga was estimated at 100,000 tons of copper metal at a grade varying between 1% and 6% copper.

Exploitation of several copper deposits in the Huíla and Cuanza Sud Districts was also authorized by the Angolan Government during 1974. One deposit is reportedly located near the Impulo administrative post in Quilengues District, two others are located in the Huíla District near Sa Da Bandeira, and a fourth is located in Munenga in the Libolo sector of the Cuanza Sud District. The exploitation of the first three deposits was reportedly granted to one company. Chromalloy American Corp., in association with Johannesburg Consolidated Investment Co. (JCI) applied to the Government for approval of a copper exploration program 160.9 kilometers east of its gold mining operations on the Canjangue and Cuengue deposits located south of Nova Lisboa.

*Gold.*—In May 1974 Chromalloy American informed its shareholders that the company would begin operations at its gold mine pilot plant utilizing ores from the Canjangue and Cuengue deposits. Enough ore has been established to keep the pilot plant operational for a 2-year period. Ores assay from 1.5 ounces per ton to 28 ounces per ton gold. Initial production, after delays in equipment deliveries, got underway at yearend 1974. The mine was reportedly producing $60,000 to $75,000 in gold in December with $125,000 to $150,000 expected each month between January and March 1975 and at the $300,000 level by April 1975. Expenses were reportedly running at about $80,000 per month. Chromalloy expected to operate the pilot plant for at least 1 year. CML, which has been prospecting for gold at Cassinga-M'Popo, was reportedly making a joint venture agreement with an undisclosed mining group for exploitation of the M'Popo gold deposits.

*Iron Ore.*—By yearend 1974, Companhia do Manganés de Angola (CMA), operator of the Cassala Mines, had decided to postpone the Cassala-Quitungo iron ore mining and pelletizing project indefinitely because of rising costs.[12] An American consulting firm was to be assigned the advance project for installation of the first phase of the pelletizing unit.

CML completed the feasibility and engineering studies for a 3-milion-ton-per-year pellet plant and associated facilities. Actual construction was to start during 1974. At yearend 1974, CML had contracted with Arthur G. McKee and Co. to conduct a pre-design and feasibility study to evaluate the technical and economic possibilities of low-grade iron ore development at its Cassinga mine. The study was expected to include a drilling program to determine whether a long-term operation can be supported, and a testing program to establish the best method to upgrade the ore. If it proves feasible, McKee will also develop plans for auxiliary installations, including townsite, powerplant, and other onsite facilities. The Cassinga mine was estimated as having proven reserves of

[9] Industries et Travaux d'Outre-Mer (Paris). Angola. V. 23, No. 256, March 1975, p. 223 (in French).

[10] Industriade de Moçâmbique (Lourenco Marques). News Section Angola, v. 7, No. 11, November 1974, p. 398–399 (in Portuguese).

[11] Caia, J. Controles paléogéographiques et sédimentologiques des minéralizations cuprifères et plombifères dans les grès due Crétacé inférieur en Afrique (Paleogeographic and Sedimentological Control of the Copper and Lead Mineralization in the Lower Cretaceous Sandstones of Africa). Bull. BRGM, (2), II, No. 1, 1974, pp. 1–124.

[12] Metal Bulletin (London). Jan. 31, 1975, No. 5962, p. 36.

100 million tons with 62% to 64% Fe and 2,000 million tons with 40% to 50% Fe.

**Nonmetals.**—*Alabaster.*—Two deposits of alabaster were discovered in Angola in the area of Benguela near Dombe Grande. Total reserves were on the order of 3,750,000 cubic meters. The price in Europe[13] of a cubic meter of alabaster was reported to be a minimum of $654.50 in 1974.

*Cement.*—Because Luanda and Lobito ports were operating irregularly, a shortage of cement occurred in late 1974, affecting the civil construction sector and the entire southern part of the country. Labor troubles caused a slowdown at Luanda's cement factory. This plant had been shipping about 1,000 tons of cement per day to other African countries. A new cement factory, requiring an investment of $155 million,[14] was authorized during the first quarter of 1974 for Moçâmedes with a capacity of 240,000 tons per year of cement.

*Diamond.*—World demand for diamond began to slip in early 1974 from the record 1973 levels. Almost all of Angola's diamond output comes from DIAMANG operations centered on alluvial deposits. In past years there has been a tendency for caratage to fall, mostly due to declines in the overall grade of diamondiferous gravels treated. Treatment plants were modernized and more mechanized equipment were used to improve recovery. DIAMANG's associated company, Consorcio Mineiro de Diamantes S.A.R.L., in which De Beers Consolidated Mines, Ltd. has a 45% stake, continued to explore vigorously, especially in the Cuango River Basin. DIAMANG held producing areas covering some 80,450 square kilometers in the Cuango and Cassai river basins. Angola's diamond reserves were estimated[15] to be 20 million to 100 million carats, of which 15 million to 25 million carats are of gem quality. World reserves were estimated at 1,000 million to 1,205 million carats.

*Feldspar, Quartz and Mica.*—The Provincial Office of Geology and Mines Service of Angola announced discovery of five feldspar and quartz deposits in a routine inspection of the Caxito region. In addition, a mica and quartz deposit was discovered in the same region at Miaila. A new deposit of "clive" quartz in a column 20 meters high was described[16] at Cassongue, situated about 40 kilometers northwest from the village of Jamba.

*Phosphate.*—Substantial phosphate deposits are known in Cabinda. The Companhia dos Fosfatos de Angola (COFAN) has been assessing their viability for some time. In 1974 the company sought a year's extension to its rights over the deposits to allow time to reassess feasibility. Phosphate deposits are also found in the Zaire District. These were being considered for working by the State-owned Diversification and Development Fund.

**Mineral Fuels.**—*Petroleum.*—During 1974 Texaco Petroleum of Angola, in its capacity as operator for the PETRANGOL-ANGOL-Texaco Association, announced the discovery of petroleum in Santo Antonio do Zaire, although sufficient quantities had not been proved for commercial production. Prospecting along the Angolan coast were Cabinda Gulf Oil Co., Argo Petroleum Portuguesa, Pesquisa e Exploracao de Petroleos, Esso Angola Ltd., and a group for Amerada Hess Corp. of Angola. Companhia de Petroleos de Angola (PETRANGOL) and the Sociedade Portuguesa de Exploracao de Petroleos, S.A.R.L. (ANGOL) in liaison with Occidental Petroleum Corporation of Portugal, Amoco Cuanza Petroleum Co., and Iberian Petroleum, were prospecting on the continental platform in the Cuanza Basin.

Portuguese Decree-Law 89/74 published March 6, 1974, in Diario do Governo contains the text of two new petroleum exploration and production contracts. One was granted to Esso, covering a deep water area of 20,000 square kilometers in the Santo António do Zaire-Ambrizete Zone. The second was awarded to Sun Oil-Amerada Hess-Cities Service International group, covering a belt of 10,000 square kilometers on land and sea less than 600 meters deep stretching from Novo Redondo to Benguela. Four years were initially allowed for exclusive rights to prospect and develop and 30 years for production. Oil may be diverted by the Government in case of war or grave emergency.

Portugal has the preferential right to ac-

[13] Industries et Travaux d'Outre-Mer. Matériaux de construction (Contruction Materials). V. 23, No. 256, March 1975, p. 226.

[14] Banco De Angola (Luanda). Boletim Trimestral, No. 65, January–March 1974, p. 25 (in Portuguese).

[15] Industries et Travaux d'Outre-Mer. Le Marche Mondial du Diamant (The World Market of Diamonds). V. 23, No. 254, January 1975, pp. 49–50.

[16] Machairas G. Un Nouveau Gisement de Quartz Clive à Cassongue (A New Deposit of Clive Quartz in Cassongue) (Angola). Bull. Soc. Fr. Mineral. Cristallogr. V. 96, No. 6, 1973, pp. 395–397 (in French).

quire 37.5% of the petroleum produced, plus an additional 12.5% of petroleum production as a tax in kind, giving together a preferential right equaling 50% of the production. The new contracts called for a 20% shareholder status for the Province of Angola. Portuguese have a major say in board member selection. Concessionaires are required to give first preference to Portuguese materials, contractors, and consultants.[17] Exxon paid a signature premium of $1.6 million while the Sun Oil group was reported to have paid a signature premium of $800,000. A Portuguese chartered company will be formed for development, of which Angola will acquire 20% of the stock. A premium is also due to Portugal on production of over 100,000 barrels per day and a pledge was made to reinvest some of the proceeds in Angola.[18]

In early 1974 PETRANGOL and ANGOL were authorized to draw up a contract with Occidental, Amoco Cuanza, and Iberian Petroleum to permit more intensive prospecting on the Continental Shelf of the Cuanza Basin. The contract provisions may be revised on demand of the State. In exports they will be exempt from customs duties and taxes with exception of 1% ad valorem statistical tax, the stamp tax, wharfage, and other payments due for services rendered that are not of a fiscal nature. The State has a right to buy a maximum of 37.5% of the total quantities of substances extracted and put on sale. Occidental, Standard Oil Co. (Indiana), and Continental Oil Co. were also reported as sharing exploration with PETRANGOL and ANGOL. Under the terms the U.S. firms together will hold 50% interest in an exploration venture covering about 7,200 square kilometers.

A group consisting of Tesoro Petroleum Corporation, San Antonio, Texas, General Exploration L.A. of California, and Geotherme S.A.R.L. of Paris expressed interest in exploration in various parts of Angola in early 1974. Application was made for the required license to prospect. Ansa Petroleum Co.[19] holds 25% of the PETRANGOL concession area south of Luanda. The South African companies, General Mining, and their associate, Federale Mynbou and Sentrust, holds 34% of Ansa; Anglo American and De Beers hold 24%, Sanlam 21%, and the rest of Ansa is distributed among Rand Mines, Ltd., Unicorp, and JCI.

Installation of a new pipeline at Cabinda caused a temporary decrease in oil production in June 1974. Petroleum exports for the first 6 months of 1974 (25.1 million barrels) from Cabinda showed a 6.5% decrease from the 1973 figures for the same period. However, the new pipeline was operating later in the year and contributed to the overall increased production for 1974 from Cabinda. A new probe "Bob Bushman" belonging to Field Viking Drilling Co. was delivered to Cabinda to be used for offshore prospecting.

Crude oil reserves were estimated at yearend 1973[20] as 1.31 billion barrels (up 6.2% from 1972). Natural gas was estimated at 41 billion cubic meters of gas (up 3.4% from 1972).

An application was made in February 1974 for construction of a 5-million-ton refinery in the Moçâmedes area by Angola Energy Ltd., a firm with headquarters in London. Refinery input will be local crude oil.[21] American capital of about $100 million will be used. The Luanda refinery was in the process of extension as authorized in December 1973. At the same meeting, the Portuguese Council authorized the installation of a refinery of solid bituminous products at Ambriz. Riverwood Corporation of the United States received the permit and was given leases to 9,000 acres of asphalt deposits located along the Lifune River on the coast, north of Luanda. Riverwood expected to put the first plant into operation by 1977.

## MOZAMBIQUE

The mineral industry in 1974 contributed significantly to the Mozambique economy, but production was down as much as 50% in some mineral commodities. A shortage of foreign exchange in mid-1974 (from June 30 to July 10) brought about a temporary closing of the petroleum refinery and an import suspension except for certain limited categories. The balance of

[17] U.S. Consulate, Luanda, Angola. State Department Airgram No. A-39, Mar. 22, 1974.
[18] Wall Street Journal. Portugal Plans to Give Exxon, 3-Firm Group Angola Oil Concessions. V. 183, No. 46, Mar. 7, 1974, p. 19.
[19] Noticiario-Angola Industries Moçâmbique (Lourenço Marques). V. 8, No. 2, February 1975, p. 74.
[20] World Oil 1974 (New York). The Boom Returns. V. 179, No. 3, Aug. 15, 1974, p. 63.
[21] O Comercio (Luanda). Huge Investments in Oil Refineries Planned. Sept. 14, 1974, pp. 1, 8. (in Portuguese).

payments deficit for 1974 was expected to be around $80 million [22] and Mozambique's external debt to surpass $650 million. The 1974 deficit reflected higher world prices for imported items such as petroleum and wheat. Mozambique had no foreign reserves and suffered an internal liquidity crisis during 1974, with some firms facing bankruptcy. A 40% increase in customs clearance fees early in 1974 was prompted by the Government's need for additional revenue to meet mounting public expenditures. It was estimated that $21 million would be collected from this source in 1974. Even though petroleum products were exempt, retail prices of gasoline and diesel oil were increased by over 50% (compared with January 1973, the increase amounted to over 200%).

The 1974 government budget was increased to $597 million, up 18.7% from the preliminary estimates. Forty million dollars was allotted to transportation improvements and $20.2 million to regional development. Banking and insurance organizations were required to finance 82.4% of the 1974 development plan. Nearly 15% was provided by the Portuguese Central Government budget. The preliminary 1975 budget was balanced at $513.9 million, but later increased with an additional $9 million by the Transitional Government.

A Transitional Government was set up on September 20, 1974, to provide a smooth transition to independence, expected on June 25, 1975. During 1974, however, Mozambique was plagued by problems and crises that made havoc of the country's economy. Three of Mozambique's major rivers, the Búzi, Pùgoè, and Zambezi, flooded in February, leaving thousands homeless and disrupting vital transportation routes between Beira and Quelimane. Despite the flood, work on the Cabora Bassa Dam was not impeded. Following the change in Portuguese Government on April 25, 1974, civil unrest and disturbances in Mozambique caused an exodus of technicians and skilled workers. Most of the civil construction, e.g., the road that links Beira with the north, was paralyzed. Dock strikes for higher pay in June, August, and September, caused further congestion and contributed to an inflation reaching an annual rate of 30%. Civil disturbances were most extreme during the week of September 7–12, and again in October, bringing traffic in the major ports to a standstill and severely limiting income from transit operations and tourism. Port and railroad activity and the tourist industry all suffered greatly during 1974.

The Mozambique economy leans heavily on its neighbors for economic stability. The Ports and Railways Administration provided over 45% of all foreign exchange earnings in 1974 through activity at the ports of Beira and Lourenço Marques which also serve Rhodesia, the Republic of South Africa, Zambia, Malawi, and Swaziland. Approximately 80% of Rhodesian import-export traffic passes through Mozambican ports. The tourist industry was an important industry in 1973, providing about $23.9 million to the economy. Approximatey 100,000 Mozambique workers were also employed in South African mines, providing 15% of the Mozambique budget paid in gold.

Major transportation improvements were announced for the fourth development plan launched in April 1974. An extension to the Gorjão wharf in Lourenço Marques would be finished at the end of 1975 at a cost of $24 million. Twenty-two diesel locomotives (purchased from the United States in 1974) and eight shunting engines were to replace steam locomotives in anticipation of growing traffic from neighboring countries. The Mozambique Government announced its intention to start a new $90 million offshore bulk loading terminal south of Lourenço Marques, scheduling completion for 1976. Known as Ponta Dobela, it will be used to load iron ore, coal, and other dry bulk materials. It will also allow liquid cargoes to be loaded or unloaded. The dry bulk storage capacity will be 1.2 million tons, and the liquid storage capacity was planned to be 800,000 tons. It was also expected to handle crude oil, pumping it to an inland tank farm.

The question of the distribution of profits from the hydroelectric complex of Cabora Bassa was yet to be solved. The principal beneficiary could be either the Portuguese or the Mozambique Governments.[23] Cabora Bassa began filling with water on December 5, 1974, and electrical production was scheduled to begin in early 1975. It was expected to have a total installed electrical capacity of 3.6 million megawatts at two generating centers with approximately 1,400 kilometers of energy trans-

[22] Where necessary, values have been converted from Mozambique escudo (M. Esc) to U.S. dollars at the rate of M. Esc = US$0.03984.

[23] Marchés Tropicaux et Méditerranéens (Paris). Problem of Dam Profits Remains. Dec. 6, 1974, p. 3346 (in French).

porting lines. The Republic of South Africa was expected to acquire 680 megawatts in 1975, increasing to 1,070 megawatts by 1977 and finally to 1,470 megawatts at yearend 1979. A program to improve the electrical network of Lourenço Marques was also announced in 1974 costing about $7.9 million between 1974 and 1980.

The Gabinete do Plano do Zambeze (GPZ) was organizing and collaborating on a number of projects for the extractive and transformative metal industries of the Tete District. They were collaborating on an electrometallurgical project based on exploitation of the titaniferous magnetite deposits of Tete; on exploitation and exploration of fluorite in the Chioco-Changara and Geramo (Canxixe) areas; on studies for establishing industries consuming electricity; on detailed geologic studies of various mineral areas, especially those along the Karoo-crystalline rock contact; on a study of coal deposits; and executing geochemical prospecting along the Nhaluiro (Chemba) River. The execution of these programs was being done with the collaboration of the Direcção de Servicos de Geologia e Minas, Inspecão Geral de Minas; Instituto Nacional de Investigaçõa Industrial; Laboratório de Fisica e Engenharia Nuclear de Moçâmbique; Serviço de Fomento Mineiro; and the University of Lourenço Marques.

A French scientific memoir was recently published[24] describing the mineralogy and geochemistry of the pegmatites in Mozambique. A long list of important minerals are produced from these rocks, including gem stones, columbite-tantalite, and radioactive minerals.

CML (associated with American Steel Company) held a mineral exploration concession for minerals except hydrocarbons and diamonds, as did Companhia Moçâmbicana de Minas S.A.R.L. (COMOCMIN), a subsidiary of JCL and Anglo American Corp.

## PRODUCTION AND TRADE

Mineral production fell in 1974, by amounts up to 50% in some commodities as compared with 1973. Bauxite, bentonite, cement, granite and quarry stone, lime, montmorillonite, and sea salt showed decreases in production, whereas coal, some gem stones, tantalite, and copper concentrates showed modest increases. An estimated 3.9 million barrels of petroleum products were produced in 1974 compared with 6.0 million barrels in 1973. Refinery production was estimated to be half its capacity by yearend 1974 due to the exodus of technicians and reduced crude oil imports.[25] Imports of petroleum products in January to July 1974 showed a 63% overall decline over the comparable 1973 period. U.S. companies reportedy purchased about 70% of Mozambique's 1974 output of tantalite, which was estimated to be 33 tons in the first 10 months of 1974, as compared with 27 tons in the same 1973 period.

The flow of goods had practically stopped during the political crisis early in 1974, but had improved by November, and the Provisional Government was making efforts to bring it back to normal. Traffic in the six major ports of Lourenço Marques, Beira, Quelimane, Nacala, Porto Amélia, and Mocímboa da Praia was down in 1974, compared with 1973. There was also reportedly a 50% decrease in ore carried by the railroad between South Africa and Lourenço Marques during 1974. The possibility of increasing the number of ore cars that operate on the Ressano Garcia line was being studied.

Kenya was reportedly investigating the possibility of making maritime shipments of goods to Nacala or Beira and then using Mozambique railroads for its exports to Zambia.

[24] Lopes Nunes J. E. Contribution to the Study of Mineralogy and Geochemistry of the Pegmatites of Mozambique. Mem. Sci. Terre, No. 26, 1973, 261 pp. (in French).

[25] U.S. Embassy, Lourenço Marques. State Department Airgram A-93, Aug. 1, 1975, 3 pp.

## Table 2.—Mozambique: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Aluminum, bauxite, gross weight | 5,419 | 5,184 | 2,405 |
| Beryllium, beryl concentrate, gross weight | [r] 7 | 1 | 8 |
| Bismuth, mine output, metal content | 3 | -- | -- |
| Columbium and tantalum, ore and concentrate, gross weight: | | | |
| Columbite-tantalite | 54 | 31 | 43 |
| Microlite | 61 | 56 | 53 |
| Tantalite | 42 | 29 | 40 |
| Copper, mine output of salable ore and concentrate: | | | |
| Gross weight | 706 | 1,629 | 2,498 |
| Metal content | 176 | 407 | 625 |
| Gold, mine output, metal content ---- troy ounces | 5 | -- | -- |
| **NONMETALS** | | | |
| Abrasives, natural, unspecified | -- | 241 | 435 |
| Asbestos | 534 | 566 | -- |
| Cement, hydraulic ---- thousand tons | 468 | 611 | 465 |
| Clays: | | | |
| Bentonite, including montmorillonite | [r] 3,535 | 3,844 | 1,793 |
| Kaolin, including china clay | [r] 1,493 | 175 | -- |
| Feldspar | 295 | 830 | [e] 900 |
| Fluorspar | 1,429 | -- | -- |
| Gem and ornamental stones: | | | |
| Beryl crystals ---- kilograms | 10 | 30 | 2 |
| Obsidian ---- do | 139,000 | -- | NA |
| Tourmaline ---- do | [r] 1,129 | -- | -- |
| Unspecified, semiprecious ---- do | 4,000 | 3,000 | 6,000 |
| Lime | 6,992 | 9,664 | 4,539 |
| Lithium minerals, lepidolite | 10 | -- | -- |
| Mica, mainly scrap | 230 | 310 | 854 |
| Salt: | | | |
| Marine | 31,217 | 41,825 | 27,680 |
| Rock [e] | 20 | 20 | 20 |
| Stone: | | | |
| Limestone ---- thousand tons | [r] 1,022 | 1,059 | 682 |
| Granite and other quarry, n.e.s ---- do | 872 | 963 | 404 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Coal, bituminous ---- do | 336 | 394 | 426 |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels | 1,020 | 1,020 | 601 |
| Kerosine ---- do | -- | 171 | 127 |
| Jet fuel ---- do | 250 | 307 | 68 |
| Distillate fuel oil ---- do | 1,469 | 1,242 | 947 |
| Residual fuel oil ---- do | 2,182 | 2,242 | 1,607 |
| Other: | | | |
| Asphalt ---- do | 226 | 241 | 80 |
| Liquefied petroleum gas ---- do | 175 | 177 | 94 |
| Refinery fuel and losses ---- do | 681 | 648 | 388 |
| Total ---- do | 6,003 | 6,048 | 3,912 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, other varieties of crude construction materials (clays, sand, gravel, and stone) may be produced for local use, but information is inadequate to make reliable estimates of output levels.

Table 3.—Mozambique: Exports of selected mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Beryllium ore and concentrate | -- | 22 |
| Columbium and tantalum minerals | 1 | 124 |
| Iron and steel: | | |
| Scrap | -- | 8,334 |
| Semimanufactures | 393 | 12,718 |
| NONMETALS | | |
| Asbestos | NA | 383 |
| Cement, hydraulic | 1,780 | NA |
| Clays, crude bentonite | r 2,037 | 2,865 |
| Fertilizers, nitrogenous | 27,018 | 18,853 |
| Gem stones, except diamond kilograms | 13,000 | 21,400 |
| Salt | 7,185 | 4,371 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Coal | 55,386 | 49,528 |
| Petroleum refinery products: | | |
| Gasoline thousand 42-gallon barrels | 371 | 317 |
| Jet fuel and kerosine do | 61 | 147 |
| Distillate fuel oil do | r 581 | 541 |
| Residual fuel oil do | 1,820 | 1,832 |
| Lubricants do | -- | 1 |
| Other: | | |
| Liquefied petroleum gas do | 54 | 46 |
| Asphalt, bitumen, and petroleum coke do | 108 | 107 |

r Revised. NA Not available.

Table 4.—Mozambique: Imports of selected mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum metal including alloys, all forms | 715 | 898 |
| Copper metal including alloys, all forms | NA | 493 |
| Iron and steel semimanufactures [1] | r 77,991 | 104,150 |
| NONMETALS | | |
| Cement, hydraulic | 33,336 | 11,647 |
| Fertilizer materials, manufactured | 34,250 | 23,172 |
| Sodium and potassium compounds, caustic soda | 2,370 | 4,939 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Coal, anthracite and bituminous | 255,577 | 243,118 |
| Petroleum: | | |
| Crude thousand 42-gallon barrels | 5,784 | 5,939 |
| Refinery products: | | |
| Gasoline do | r 122 | 129 |
| Kerosine do | r 224 | 151 |
| Jet fuel, distillate fuel oil, residual fuel oil do | r 884 | 952 |
| Lubricants do | 62 | 92 |
| Bitumen and petroleum coke do | 31 | 9 |

r Revised. NA Not available.
[1] Partial figure, but believed to represent by far the largest part of the total.

## COMMODITY REVIEW

**Metals.**—*Bauxite.*—The Alumen mine near Manica has produced 5,000 tons to 7,000 tons per year from ore that contains 62.3% $Al_2O_3$, 3% $SiO_2$, and 2.2% $Fe_2O_3$. Reserves of the deposit at Milange near Manica in Vila Pery District were reported to be an estimated 60 million tons of 43.73% $Al_2O_3$.[26] Other deposits are known to occur in the Zambézia District as alteration products of rocks in the alkaline province of Chirua.

*Copper.*—Copper ore was produced at the Edmundian mine in Manica, which reportedly was valued at $987,733 in 1973.[27] After suspension of mining in 1968, the Edmundian was reactivated in 1970, producing 22% copper concentrates from min-

[26] Industriade Moçâmbique (Lourenço Marques). Mozambique, In the Presence of Development (II). V. 8, No. 1, January 1975, pp. 1–42 (in Portuguese).
[27] Industriade Moçâmbique (Lourenço Marques). A Actividade Mineira em Moçâmbique (Mining Activity in Mozambique). V. 7, No. 11, November 1974, p. 380.

eralized greenstone ore containing 2.7% copper.

*Gold.*—The Braganca, Monaque, and Chua gold mines in the Manica District near the Rhodesian frontier were reported[28] as being reopened. The Monarch, and possibly Guy Fawkes, Dot's Luck, and Boa Esperanca mines, as well as gold-bearing terrains in other parts of the country, were also being considered for reworking.

*Iron.*—There are numerous occurrences of iron minerals in Mozambique, according to the Mozambique Geological Services,[29] which together constitute a total estimated resource of about 272 million tons, of which about 49 million can be classified as reserves. These generally can be classed into three types: (1) magmatic injection deposits, (2) pyrometasomatic deposits, and (3) sedimentary deposits. In the first category are the titaniferous magnetite deposits of Massamba, Inhantipissa, Chizita, Machédua, Caldas Xavier and Doa (Pangula Mountain) that occur in the Precambrian gabbro anorthosite complex of the Tete District. The Mozambique Geological Services calculated the "certain" reserves of the Massamba deposit to be 4.5 million tons, the Machédua to be 1 million tons, Caldas Xavier to be 2 million tons, and the Inhantipissa to be 3 million tons. Another 50 million was possible in Tenze Mountain. The Doa deposit was estimated to be 18 million tons. The chemical composition of the ore reportedly varies little from deposit to deposit, and generally contains 47% Fe, 13% $TiO_2$, 5% $SiO_2$, and 0.20% $V_2O_5$.

In the pyrometasomatic category is a series of deposits occurring in Precambrian limestones near Fíngoè including the Muândi, Luzina, Meungoè, and Tumba deposits. The most important of these is Muândi and was reported to have reserves of 6.8 million tons. One to 2 million tons were estimated for Tumba, 2 million for Muengoè, and less than 1 million at Luzina. The ore generally contains 65% Fe, 1% $SiO_2$, and 0.10% to 0.20% $TiO_2$.

Sedimentary-type deposits include the banded ironstones of the Macequeca formation in the Vila Pery District and the itabirites of the Tete, Zambezia, and Moçâmbique Districts. The Honde deposits, located along the bank of the Honde River, are composed of a number of itabirite outcrops of the Manica System and were estimated to contain resources of 100 million tons of 38% Fe, which could be upgraded to 40% by grinding and magnetic separation. The most important deposits, under examination by the Hondeminas Co.,-Sociedade Mineira, S.A.R.L., were the Mabota, Machacauira, Chito Sul, and Nhandiro. The Mavita and Tsetsera deposits occur in metasediments of the Manica System. The Mavita deposit was estimated to contain reserves of 15 million tons with an average 30% Fe. This could be upgraded to about 58% Fe by grinding and magnetic separation. Other deposits include the Chaca deposit, estimated to have more than 6 million tons (possibly 60 million tons as initially attributed) and the Nhancungue, Ruo, Miravone, and Iapala deposits with characteristics similar to the Chaca deposit but more limited and less regular in occurrence.

In March 1974, Companhia de Moçâmbique (Siderurgia de Moçâmbique) announced plans to build steel mills at Tete and Beira. In the first stage, entering into production by 1977, a furnace at Tete would use local iron ore to make pig iron, which would be shipped to a steel mill at Beira. The initial capacity of the pig iron plant will be 25,000 tons per year, eventually raised to 100,000 tons per year. An authorization was also given at the beginning of 1974 for construction of a foundry at Nampula.

*Nickel.*—The possibility of nickel deposits in the ultrabasic rocks of the Tete, Moçâmbique, and Vila Pery (Manica) Districts was indicated by geochemical anomalies. The Atchize area is characterized by serpentines and gabbros with disseminated pyrrhotite.[30] Garnierite was also observed.

*Titanium Minerals.*—Coastal dunes containing 5% to 15% heavy mineral layers of ilmenite (78%), zircon (13%), monazite (5%), and rutile (2%), occur between Majanja da Costa and Moma.[31] Rutile seems to be the highest in the Raraga region. At Mobase reserves of these minerals were estimated to be about 18 million tons, corresponding to about 2 million tons of concentrate ore. At Nabúri-Moma, there was estimated 6 million tons of dune material containing mineral concentrates.

[28] Industries et Travaux d'Outre-Mer (Paris). Afrique Australe. V. 23, No. 256, March 1975, p. 271 (in French).

[29] Direccao Dos Servicos De Geologia e Minas (Lourenço Marques). Carta de Jazigos e Ocorrencias Minerais (Map of Deposits and Mineral Occurrences). Imprensa Nacional de Moçambique, 1974, scale 1:3,000,000, explanation, 60 pp.

[30] Work cited in footnote 29.

[31] Work cited in footnote 29.

Destruction of these dunes by the sea has also resulted in extremely rich concentrations of heavy minerals along the coast under water, principally in the region of Pebane, where the amount of heavy mineral layers reaches 70% to 80%. Large deposits of titanium minerals and zircon, estimated at 30 million tons ilmenite, 2 million tons rutile, and 3 million tons zircon, were discovered along the coast of Mozambique by the West German Preussage A.G. exploration group during 1974. The deposits were discovered at a depth of 30 meters.

*Uranium.*—The Companhia do Urânio de Moçâmbique indicated the existence of 26 uranium deposits at Moatize in the Tete District.

**Nonmetals.**—*Cement.*—CM was licensed in May 1974 to increase cement production at its Salazar plant in the Lourenço Marques District.[32] In early 1974 a contract was signed between CM and the Banco de Fomento Nacional for the financing of a fourth line of cement manufacture at its Matola plant. The investment necessary for this operation totaled $15.9 million. The extension was reported as starting in late 1974, allowing an additional production of 2,500 tons per day of cement. When coal operations were temporarily suspended during 1974, officials of the cement works near Beira, whose operations depend on coal supplies from Moatize, expected to import coal from the Republic of South Africa.

*Clays.*—Extension and modernization of equipment was planned for the ceramic factory at Lourenço Marques. Kaolin from the Tete deposits was to be substituted for imported kaolin.

*Diamond.*—Companhia de Diamantes de Moçâmbique, S.A.R.L. (a subsidiary of De Beers Associated with Anglo American Corp.) was exploring for diamond in Tete province near the Malawi border. Diamonds were reportedly found, and mining was planned for 1975. The original concession terminated on September 20, 1974.

*Fluorite.*—Bethlehem Steel temporarily halted large-scale exploration activity for fluorite in April 1974 because of the uncertain political situation. About 600,000 tons of fluorite (65% average grade fluorite) were reported in Djanguire, Tete. Sixty million tons of lower grade ore (16% to 26% fluorite) was also reported in other deposits of the Tete, Vila Pery, and Beira areas.

*Gems and Semiprecious Stones.*—Deposits of semiprecious stones exist principally in Zambezia, Niassa, and Moçâmbique Districts. The most important occurrences include those of tourmaline in the Alto Ligohna and Nacala areas, beryl crystals (aquamarine and emerald) from Zambezia, and garnets from the Nova Freixo area, Niassa District. Deposits also occur in the Tete, Vila Pery, Lourenço Marques, Inhambane, and Beira Districts. In the pegmatite areas, along with beryl and tourmaline also occurs amazonite, citron and rose quartz, topaz, morganite, and very rare kunsite and hiddenite crystals.[33]

**Mineral Fuels.**—*Coal.*—Three basins contain coal in quantity: The Moatize-Minjova, Sanangoé-Mefideze, and Chicoa-Mecúcoè. The Moatize-Minjova Basin was the only producing area and was being developed and explored by the Companhia Carbonífera de Moçâmbique S.A.R.L. (CCM) and the Companhia Carbonífera de Moatize, owned 41% by Dias da Cunha, 49% by South African Iron and Steel Industrial Co., Ltd. (ISCOR), and 10% by the State of Mozambique. Reserves were estimated at approximately 400 million tons, 40% of which was reportedly noncoking coal. The Government had hoped that production would be modestly increased in 1974. Plans included: Export of 1 million tons of raw coal per year to ISCOR and 400,000 tons per year of beneficiated coal to Japan, eventually increasing to 4 million tons; to supply 70,000 to 130,000 tons per year of raw coal for the planned aluminum industry; 100,000 to 150,000 tons per year of coking coal for the metallurgical industry of Tete; increasing to 400,000 tons per year including railway and cement factory needs. A total of 5.8 million tons per year was planned to be exported. The firm was studying both underground or open pit alternatives for expansion. However, operations were suspended in early 1974; once after guerrilla action on the Tete-Moatize railroad, and again because of drainage problems. A few European export contracts were lost, and local companies were forced to import coal for their operations. The action also affected approximately 1,300 coal miners.

Coal deposits in the Sanagoé-Mefídeze Basin are similar to those at Moatize-Minjova. A great part of this concession, located south of Songa, Tete District, is held by COMOCMIN, a company affiliated with the South African firm JCI. A number of other companies were report-

[32] Industriade Moçâmbique (Lourenço Marques). Movement of Industrial Licenses in Mozambique. V. 7, No. 6, June 1974, p. 230.
[33] Work cited in footnote 29.

edly interested in the 150-kilometer-long tract of land between Chicoa and Mecúcoè along the Zambezi River and above the Cabora Bassa Dam. Coal mined in this area could be transported via river on the upper Zambezi. Barge transportation of coal was under study by a firm under contract to the Zambezi Plan Bureau. The study was also to consider the economic feasibility of building a port at the mouth of the Zambezi River and a railroad spur from Tete to the river.[34] Other coal deposits[35] occur near the Gama River, south of Espungabera near the Rhodesian border; in the north near the Lugenda, Luchímua, and Lângua Rivers; and north of Maniamba on the Lunho River.

*Petroleum and Natural Gas.*—According to a 1974 report[36] by the Mozambique Services of Geology and Mines, gas reserves totaling 121 billion cubic meters were reported in the three fields discovered by Mozambique Gulf Oil. Gas reserves analyzed as 95.5% methane occur in the Pande Field (estimated at $114 \times 10^9$ cubic meters), Temane Field (estimated at $3 \times 10^9$ cubic meters), and Búzi Field (estimated at $4 \times 10^9$ cubic meters). An important petrochemical complex utilizing the Pande gas to make ammonia and synthetic fertilizer was envisaged by the Government.

Oil exploration, suspended earlier in 1974, was expected to resume in December at the mouth of the Zambezi River. Hunt International Petroleum Company was expected to explore the Beira area and near the mouth of the Zambezi River in 1975, spending approximately $2.4 million. Hunt relinquished another 25% of its original 20,720-square-kilometer concession, thus retaining approximately 10,360 square kilometers for the next 2 years. Texaco had requested permits for two areas, from Rovumo to Lúrio (in 1969) and the offshore region from Ponta do Oura to Inhambane (in 1974). The Texaco area near the Tanzania border was approved early in 1974, but the southern area near Inhambane was still pending. The changing political situation in Mozambique had caused withdrawal of some interests during 1974 and encouraged others. Kilroy Petroleum Co. Ltd. and Imperial Oil Ltd. of the United States, and the South African company Southern Oil Exploration Corp. (Pty) Ltd. (SOEKOR), reportedly withdrew requests for petroleum permits. The U.S. company Anshutz Overseas Corp. requested a concession extending from Beira to just north of Quelimane and was also reportedly interested in the Pande gasfield. World Mineral Limited, registered in Liberia and a subsidiary of an American company (Eastern Petroleum), requested a petroleum exploration concession in the Chibuto area near Lourenço Marques. Carlsberg Petroleum of California was also showing interest in Mozambique petroleum exploration.

The Sociedade Nacional de Refinação de Pétroleos, S.A.R.L. (SONAREP) refinery located at Lourenço Marques suspended operations in June and early July 1974 because of a lack of foreign exchange credits to pay crude oil suppliers.[37] The prospects of exporting petroleum products to other African countries such as Zambia, Tanzania, and Madagascar were being examined along with plans for refinery expansion. Swaziland was reportedly the only African country importing products from the SONAREP refinery in 1974.

## GUINEA BISSAU (FORMERLY PORTUGUESE GUINEA)

Portugal granted independence to Portuguese Guinea on September 10, 1974, under an agreement signed on August 26 in Algiers. The ruling party had previously renamed the new nation Guinea Bissau. Guinea Bissau has no important mineral production and depends upon peanuts and rice for exports and exchange earnings. The nation of approximately 800,000 inhabitants consumes an estimated 70% of its agricultural production. Oil prospecting has been carried out, and resources of phosphate, gold, zircon, iron, and bauxite have been reported. Esso Exploration Guinea Inc. and Western Geophysical had been prospecting for oil offshore Guinea Bissau. Electricity is produced exclusively by thermal generators, and in 1973 the total installed electrical capacity for the country was 10,742 kilowatts.[38]

[34] U.S. Embassy, Lourenço Marques. State Department Airgram A-65, Mar. 29, 1974.
[35] Work cited in footnote 29.
[36] Page 17 of work cited in footnote 29.
[37] O Seculo (Lisbon). Mozambique's Only Refinery Closed. June 27, 1974, p. 8 (in Portuguese).
[38] Industries et Travaux d'Outre-Mer (Paris). Guinea Bissau. V. 22 No. 253, December 1974, p. 1100.

## OTHER PORTUGUESE POSSESSIONS

Cape Verde Islands was scheduled to achieve independence from Portugal in 1975 according to an agreement made in December 1974. A transitional government was setup in the interim. The islands have been hit hard by a drought lasting 7 years. As a result little food production or other industry exists for the population of more than 270,000, who are dependent upon imports. Unexploited mineral deposits such as phosphates, strontium, and gypsum have been reported. Carbonatites containing barium and strontium were reported [39] as representing the only known occurrence of such rocks in an oceanic environment. Oil prospecting has been carried out by Hidrocarbonetos de São Tome e Principe, a subsidiary of Ball and Collins (Oil and Gas) Ltd. of London and Texas Pacific Oil Co. Inc. of Portugal in offshore areas. Naveril Enterprises requested a permit in 1974 from the Cape Verde Government to enlarge a 6-million-ton petroleum and byproducts refinery to be setup on São Vincente Island so that fertilizers, insecticides and other products may also be produced. An investment of $86,580 [40] was visualized The same firm was also studying the possibility of desalinized water and electricity production for the island.

São Tome et Principe Islands were also to achieve independence from Portugal in 1975. The island nation has a population of approximately 70,000 and no important mineral production, although oil prospecting by the British group of Ball and Collins has been done. No field exploration was carried out in 1973 by this company, which was the only concessionaire.

[39] Baker, P.E. Islands of the South Atlantic in The Ocean Basins and Margins. The South Atlantic, ed. by Nairn and Stehli. Plenum Press, New York, v. 1, 1973, pp. 527–530.

[40] Where necessary, values have been converted from Portuguese escudo (P. esc) to U.S. dollars at the rate of P. esc=US$0.04329.

# The Mineral Industry of Argentina

By John L. Albright [1]

Argentina maintained its position as one of South America's most industrialized nations, and its mineral industry was one of the most active on the continent. South America's leading diatomite, feldspar, gypsum, mica, peat, and pumice producers operated in the country; and Argentina was the continent's second largest producer of cement, crude oil, fluorspar, iron and steel, lead, and natural gas. Its production of crude oil was larger than the combined output of Brazil, Chile, and Colombia.

The country became more dependent on foreign sources of petroleum in 1974 as domestic production of crude oil fell, and imports of petroleum increased. Crude oil production had peaked in 1972, when the Argentine output totaled 159 million barrels. The domestic coal, iron, and steel industries were being developed during 1974, and mining industry officials were evaluating plans to develop iron ore deposits in Misiones Province and initiated a series of studies concerning the development of alunite, barite, and fluorspar deposits in Chubut Province in southern Argentina.[2]

Several petrochemical plants were being constructed, and expansions were made to petroleum refining and transportation facilities. Plans were developed to build an additional refinery, a lubricating oil plant, and a fertilizer plant. In an effort to broaden its energy base and make necessary supplies of electricity available to the industrial and mining sectors of the economy, the Government studied plans to install new nuclear and hydroelectric generating plants. Hydroelectric powerplants were under construction during the year on Río Futaleufú and Río Uruguay. Construction of one nuclear powerplant was completed, work began on another, and the country's first aluminum plant was commissioned during the year. Negotiations were carried out with foreign economic and trade groups to develop Argentine mining, manufacturing, petroleum, and petrochemical industries.

During the first quarter of 1974, the Government implemented the Mining Promotion Law of November 1973 by publication of Decree No. 443/74. According to the decree, Certificates for Mining Promotion would be issued by the Government to mining companies for approved projects to promote mining investments. The decree also prohibited the export of certain unrefined, semiprocessed, or mineral concentrates.

## PRODUCTION

Argentina was South America's second largest producer of petroleum and natural gas in 1974. Crude oil production totaled 151 million barrels, a decrease of less than 2% from the 1973 output. Yacimientos Petrolíferos Fiscales (YPF), the Government oil entity, accounted for 72% of the output, and nearly all of the remainder came from areas operated by private companies under service contracts with YPF. Amoco Argentina Oil Co., Argentina Cities Service Co., and YPF were the largest producers; eight other oil companies were engaged in producing crude oil in the country. More than one-half of the domestic output

[1] Mineral specialist, Division of Petroleum and Natural Gas.

[2] Mining Annual Review 1975. Argentina. Mining Journal (London), June 1975, p. 343.

came from wells in Chubut, Mendoza, and Santa Cruz Provinces, and important quantities of crude oil were produced in the Provinces of Jujuy, LaPampa, Neuguén, Río Negro, Salta, and in the territory of Tierra del Fuego.

The gross production of natural gas totaled 332.9 billion cubic feet, an increase of 18 billion cubic feet or 5.7% above natural gas production during 1973. Nearly 80% of the gas production was by YPF, and YPF contractors accounted for the remaining output, less 0.7% of the total which was produced by several private companies.

Cement, coal, pig iron and steel all recorded important increases in production during the year.

**Table 1.—Argentina: Production of mineral commodities**

(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Antimony, mine output, metal content ---------- kilograms -- | r 21,069 | 1,200 | 1,800 |
| Beryllium, beryl concentrate, gross weight ---------- | r 187 | 185 | 113 |
| Bismuth, mine output, metal content ---------- kilograms -- | -- | -- | -- |
| Chromium, chromite, gross weight ---------- | ([2]) | -- | 50 |
| Columbium-tantalum, columbite-tantalite concentrates, gross weight ---------- kilograms -- | r 2,400 | 1,896 | 990 |
| Copper: | | | |
| Mine output, metal content ---------- | r 1,125 | 284 | 174 |
| Smelter [e] ---------- | 80 | 80 | 100 |
| Iron and steel: | | | |
| Iron ore and concentrate, gross weight ---- thousand tons -- | r 259 | 237 | 151 |
| Pig iron ---------- do ---- | 849 | 804 | 1,067 |
| Ferroalloys, electric furnace ---------- do ---- | r 42 | 44 | 49 |
| Crude steel ---------- do ---- | r 2,150 | 2,205 | 2,404 |
| Semimanufactures [3] ---------- do ---- | 2,874 | 3,185 | 3,123 |
| Lead: | | | |
| Mine output, metal content ---------- | r38,364 | 35,120 | 34,500 |
| Smelter ---------- | r 35,300 | 32,200 | 35,000 |
| Manganese ore and concentrate, gross weight ---------- | r 14,289 | 12,588 | 19,460 |
| Silver, mine output, metal content ------ thousand troy ounces -- | r 3,273 | 2,441 | r 2,500 |
| Tin, mine output, metal content ---------- long tons -- | r550 | 426 | e 580 |
| Tungsten, mine output, metal content ---------- | 158 | 83 | 53 |
| Uranium, mine output, $U_3O_8$ content ---------- kilograms -- | r 44,705 | 46,089 | 39,186 |
| Zinc: | | | |
| Mine output, metal content ---------- | r 44,527 | 40,596 | 40,075 |
| Smelter ---------- | r 36,500 | 33,300 | 37,200 |
| **NONMETALS** | | | |
| Asbestos ---------- | 908 | 620 | 896 |
| Barite ---------- | 23,265 | 28,765 | 30,988 |
| Boron minerals, crude ---------- | 52,438 | 63,380 | 74,095 |
| Cement, hydraulic [4] ---------- thousand tons -- | 5,445 | 5,221 | 5,435 |
| Chalk ---------- | 64,744 | 41,710 | 24,089 |
| Clays: | | | |
| Bentonite ---------- | r107,079 | 101,648 | 68,268 |
| Foundry earth ---------- | 1,300 | 1,066 | 500 |
| Fuller's earth (decolorizing clay) ---------- | 479 | 357 | 194 |
| Kaolin ---------- | r 90,321 | 99,205 | 77,382 |
| Refractory ---------- | 145,156 | 175,614 | 134,527 |
| Other ---------- thousand tons -- | r 1,671 | 2,094 | 2,077 |
| Diatomite ---------- | 10,802 | 16,319 | 7,247 |
| Feldspar ---------- | r 62,187 | 30,420 | 15,857 |
| Fertilizer materials: | | | |
| Crude, natural phosphates (guano) | 410 | 541 | 393 |
| Manufactured: | | | |
| Nitrogenous ---------- | 95,126 | NA | [5] 50,834 |
| Phosphatic (Thomas slag) ---------- | e 18,000 | e 19,000 | 19,820 |
| Ammonia, anhydrous ---------- | 4,778 | NA | 44,200 |
| Fluorspar ---------- | 60,177 | 45,968 | 32,645 |
| Graphite ---------- | 25 | 94 | 38 |
| Gypsum, crude ---------- | r 513,124 | 454,382 | 331,819 |
| Lithium, spodumene and amblygonite, gross weight ---------- | 49 | 100 | 89 |
| Mica: | | | |
| Sheet ---------- | 116 | 435 | 328 |
| Waste and scrap ---------- | r 2,640 | 2,505 | e 1,466 |
| Pigments, natural mineral, ocher ---------- | 264 | 167 | 100 |
| Pumice and related volcanic materials ---------- | 32,525 | 34,423 | 15,010 |
| Rhodochrosite ---------- | 135 | 119 | 24 |
| Salt: | | | |
| Rock ---------- thousand tons -- | 1 | 2 | 1 |
| Solar ---------- do ---- | r 819 | 698 | 372 |
| Total ---------- do ---- | r 820 | 700 | 373 |

See footnotes at end of table.

## Table 1.—Argentina: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Sand and gravel: | | | | |
| Sand: | | | | |
| Construction | thousand tons | [r] 12,590 | 10,580 | 9,189 |
| Silica sand (glass sand) | do | 168 | 157 | 118 |
| Gravel | do | 4,490 | 5,908 | 4,530 |
| Stone: | | | | |
| Dimension: | | | | |
| Flagstone | | [r] 76,638 | 79,234 | 52,738 |
| Granite: | | | | |
| Blocks | | 20,349 | 29,945 | 22,353 |
| Other forms | | 21,464 | 11,200 | NA |
| Marble and other calcareous, n.e.s | | [r] 20,342 | 23,778 | 25,201 |
| Sandstone | thousand tons | 1,419 | 249 | 196 |
| Crushed, broken and unspecified: | | | | |
| Basalt | do | [r] 3,729 | 3,003 | 2,578 |
| Calcite nonoptical | do | [r] 18 | 16 | 9 |
| Dolomite | do | [r] 269 | 218 | 149 |
| Granite, crushed | do | [r] 6,228 | 4,730 | 3,418 |
| Limestone | do | [r] 12,793 | 12,582 | 9,080 |
| Marble rubble | do | [r] 92 | 89 | 80 |
| Quartz | do | 92 | 82 | 70 |
| Quartzite | do | [r] 1,182 | 1,237 | 1,010 |
| Serpentine | do | 46 | 47 | 32 |
| Shell marl | do | [r] 53 | 761 | 562 |
| Strontium minerals, celestite | | 1,096 | 741 | 526 |
| Sulfates, natural: | | | | |
| Aluminum (alum) | | [r] 15,425 | 15,744 | 16,987 |
| Iron (melanterite) | | 150 | 60 | 25 |
| Magnesium (epsomite | | [r] 1,215 | 2,031 | 1,788 |
| Sodium (mirabilite) | | 19,470 | 43,340 | 30,396 |
| Sulfur, elemental, refined | | [r] 62,210 | 59,669 | 46,199 |
| Talc and related materials: | | | | |
| Pyrophyllite | | 8,325 | 6,313 | 4,187 |
| Steatite | | [r] 7,755 | 5,961 | 2,198 |
| Talc | | [r] 28,612 | 38,227 | 31,676 |
| Vermiculite | | 4,148 | 2,548 | 2,295 |
| Zeolite | | 85 | 27 | 24 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Asphalt and bitumen, natural | | 5,562 | 3,668 | [e] 1,549 |
| Carbon black [e] | | 30,000 | 30,000 | 35,000 |
| Coal, bituminous | thousand tons | 694 | 453 | 626 |
| Coke, all types, including breeze | do | [r e] 500 | [r e] 550 | 650 |
| Gas, natural: | | | | |
| Gross production | million cubic feet | 277,643 | 314,793 | 332,839 |
| Marketed | do | 218,350 | 237,737 | 255,536 |
| Natural gas liquids: | | | | |
| Natural gasoline | thousand 42-gallon barrels | 106 | 74 | NA |
| Butane | do | 4,094 | [e] 8,426 | NA |
| Propane | do | 3,171 | | NA |
| Total | do | 7,371 | [r e] 8,500 | [e] 9,300 |
| Peat, agricultural | | 6,431 | 10,419 | 8,740 |
| Petroleum: | | | | |
| Crude oil | thousand 42-gallon barrels | [r] 158,797 | 153,734 | 151,106 |
| Refinery products: | | | | |
| Gasoline | do | [r] 38,022 | 39,968 | 38,542 |
| Jet fuel | do | 2,820 | 2,536 | 2,729 |
| Kerosine | do | 5,836 | 5,689 | 6,449 |
| Distillate fuel oil | do | 41,609 | 41,289 | 39,499 |
| Residual fuel oil | do | 59,148 | 49,302 | 47,183 |
| Lubricants | do | 1,544 | 1,726 | 1,778 |
| Other: | | | | |
| Liquefied petroleum gas | do | NA | 10,109 | 10,425 |
| Asphalt | do | [r] 3,879 | 3,215 | 2,804 |
| Petroleum coke | do | [r] 2,640 | 2,329 | 2,610 |
| Unspecified | do | [r] 5,715 | -- | -- |
| Refinery fuel and losses | do | 7,975 | 15,989 | 17,804 |
| Total | do | [r] 169,188 | 172,152 | 169,823 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, cadium, lime, perlite, and urea are also produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates as output levels.

[2] Revised to none.

[3] Hot rolled semimanufactures only; excludes (1) castings and (2) cold rolled semimanufactures produced from imported hot rolled semimanufactures.

[4] Excludes white cement.

[5] Partial figure, excludes other unspecified nitrogenous fertilizers.

[6] Partial figure, rafaelite only, excludes pyrobitumen.

## TRADE

The Government continued its program of import controls over numerous commodities that it established in 1972, and exercised controls over the exportation of a wide range of raw and semiprocessed materials and numerous finished products containing aluminum, copper, and tin. An export ban was enforced on numerous commodities including iron and steel scrap, unworked stainless steel plates, lead and zinc ore, and sulfur. Exports of most iron and steel products were subjected to prior approval by the State organization Fabricaciones Militares (FM).

Imports of crude oil in 1974 were valued at $342.8 million,[3] more than double the $115.1 million value placed on the oil imports in 1973. About one-half of the crude oil imported in 1974 came from Libya (more than three-fourths of the oil supplies came from North Africa and the Middle East), and Argentina negotiated the purchase of 38 million barrels of Libyan crude oil to be delivered in 1975. Bolivia and Saudi Arabia had been Argentina's principal suppliers of crude oil in 1973.

Argentina and Bolivia signed an extensive economic agreement in 1974 that included provisions for future sales of Bolivian iron and steel products and natural gas to Argentina; developing telecommunication and transportation links between the two countries; and stimulating the exploration, exploitation, and trade of hydrocarbons. The two countries also agreed to study the development of hydroelectric generating plants and the feasibility of establishing a joint-venture nitrogenous fertilizer plant. They further agreed to stimulate trade with one another and to examine the reduction or removal of trade barriers.

Argentina and Brazil negotiated an agreement whereby they will establish a joint company to exploit and market iron ore from Brazil's Corumba deposit near the Argentine border. Argentina may purchase large quantities of Brazilian iron ore and manganese over the next 50 years, under the terms of the agreement.

Economic agreements signed by Argentina and Romania provided for cooperation in developing chemical, metallurgical, mining, petrochemical, petroleum, and steel industries. According to the agreements the two countries will attempt to expand the exchange of technology and develop joint production and marketing ventures. Romania reportedly extended $100 million to Argentina for the purchase of Romanian capital goods and equipment, which may be repaid with Argentine industrial products.

[3] Where necessary, values have been converted from Argentine pesos (M$N) to U.S. dollars at the normal financial rate of M$N9.98=US$1.00.

**Table 2.—Argentina: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum: | | |
| Oxide (alumina) and hydroxide | 2 | 1 |
| Metal including alloys, all forms | 332 | 1,618 |
| Antimony metal including alloys, all forms | (1) | -- |
| Beryllium, beryl ore and concentrate | 100 | 100 |
| Cadmium metal including alloys, all forms | 15 | 6 |
| Chromium: | | |
| Chromite | -- | 100 |
| Oxide and hydroxide kilograms | 950 | 100 |
| Copper metal including alloys, all forms | 527 | 1,174 |
| Iron and steel: | | |
| Metal: | | |
| Scrap | 2 | -- |
| Ferroalloys | 294 | -- |
| Ingots and other primary forms | 47,962 | -- |
| Semimanufactures: | | |
| Bars and rods: | | |
| Wire rods | 22,455 | 84,605 |
| Other bars and rods | 71,068 | 158,113 |
| Angles, shapes, sections | 104,539 | 123,756 |
| Universals, plates, sheets | 43,872 | 99,617 |

See footnotes at end of table.

## Table 2.—Argentina: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| Iron and steel—Continued | | |
| Metal—Continued | | |
| Semimanufactures—Continued | | |
| Hoop and strip | 866 | 1,339 |
| Rails and accessories | (1) | 587 |
| Wire | 10,461 | 17,417 |
| Tubes, pipes, fittings | 10,261 | 19,043 |
| Castings and forgings | 65 | 231 |
| Lead: | | |
| Ore and concentrate | 33 | -- |
| Oxide | 1 | -- |
| Metal including alloys, all forms | 69 | -- |
| Magnesium metal, all forms | 33 | -- |
| Nickel metal, scrap | (1) | -- |
| Silver metal, thousand troy ounces | 793 | 341 |
| Tin: | | |
| Ore and concentrate, long tons | 4,883 | 2,714 |
| Metal, do | (1) | -- |
| Tungsten: | | |
| Ore and concentrate | 207 | 66 |
| Metal including alloys, all forms, kilograms | -- | 6 |
| Zinc: | | |
| Oxide | 185 | 409 |
| Metal including alloys, all forms | 81 | 157 |
| Other: | | |
| Ore and concentrate | 75 | -- |
| Ash and residue containing nonferrous metals | 1,153 | 670 |
| Dross and slag | 41 | -- |
| NONMETALS | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc, kilograms | 5,392 | 8,937 |
| Grinding and polishing wheels and stones, do | 7,896 | 18,766 |
| Asbestos | 4 | 1 |
| Boron materials: | | |
| Crude natural borates | 2,700 | 5,857 |
| Oxides and acid | (1) | 219 |
| Cement | 16,421 | 8,473 |
| Chalk | -- | 5 |
| Clays and clay products, including all refractory brick: | | |
| Crude clays, n.e.s.: | | |
| Bentonite | 9,470 | 14,116 |
| Kaolin | 66 | 77 |
| Other | 48 | 124 |
| Products: | | |
| Refractory, including nonclay bricks and cement | 92 | 190 |
| Nonrefractory | 549 | 1,077 |
| Diamond, industrial, thousand carats | 995 | -- |
| Diatomite and other infusorial earth | 41 | 32 |
| Feldspar | -- | 20 |
| Fertilizer materials: | | |
| Crude: | | |
| Nitrogenous | -- | 18 |
| Manufactured: | | |
| Nitrogenous | 3 | 4 |
| Phosphatic: | | |
| Thomas slag | 30 | 30 |
| Other | 68 | -- |
| Potassic | 20 | -- |
| Mixed | 231 | 410 |
| Ammonia | 445 | 544 |
| Fluorspar | 4,274 | 7,100 |
| Gypsum and plasters | 12,517 | 11,217 |
| Lime | 158 | 36 |
| Lithium and lithium compounds | 10 | 10 |
| Mica, crude, including splittings and waste | 2,848 | 2,552 |
| Pigments, mineral: | | |
| Natural, crude | -- | 3 |
| Iron oxides, processed | 6 | 544 |
| Salt | 84,122 | 79,415 |
| Sodium and potassium compounds, n.e.s.: | | |
| Caustic soda | 16 | (1) |
| Potassium hydroxide | (1) | -- |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude | 15,246 | 16,075 |
| Worked | 230 | 1,591 |

See footnotes at end of table.

## Table 2.—Argentina: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel—Continued | | | |
| Dolomite | | 1,169 | 840 |
| Gravel and crushed rock | | 27 | 8,634 |
| Quartz | | 15 | 20 |
| Sand | | 22 | 1,753 |
| Ornamental: | | | |
| Onyx | | 72 | 1 |
| Rhodochrosite | | 116 | 89 |
| Sulfur, elemental | | 18 | 3 |
| Sulfuric acid | | 206 | 219 |
| Talc, steatite, soapstone, pyrophyllite | | 330 | 388 |
| Other nonmetals, n.e.s.: | | | |
| Crude | | 43 | 340 |
| Slag, dross and similar waste, not metal bearing | | 844 | 523 |
| Bromine, iodine and fluorine | | 2 | 3 |
| Oxides, hydroxides and peroxides of strontium, barium or magnesium | | 74 | 74 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | | 703 | 488 |
| Carbon black | | 8,552 | 8,822 |
| Coal, all grades | | 3,356 | 3,023 |
| Rare gases, argon and other | kilograms | 6 | 17 |
| Petroleum refinery products: | | | |
| Gasoline | thousand 42-gallon barrels | 2,944 | 18 |
| Kerosine | do | (1) | (1) |
| Distillate fuel oil | do | 24 | 97 |
| Residual fuel oil | do | 5 | (1) |
| Lubricants | do | 16 | 104 |
| Liquefied petroleum gas | do | 8 | -- |
| Other | do | 996 | 285 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | (1) | 17 |

[1] Less than ½ unit.

## Table 3.—Argentina: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | | 1973 |
|---|---|---|
| METALS | | |
| Aluminum: | | |
| Bauxite and concentrate | | 17,252 |
| Oxide (alumina) and hydroxide | | 9,903 |
| Metal including alloys, all forms | | 77,256 |
| Antimony: | | |
| Ore and concentrate | | 319 |
| Metal including alloys, all forms | kilograms | 4,102 |
| Arsenic: | | |
| Trioxide and acids | | 526 |
| Metal including alloys, all forms | | 16 |
| Bismuth metal including alloys, all forms | | 24 |
| Cadmium metal including alloys, all forms | kilograms | 58 |
| Chromium: | | |
| Chromite | | 374 |
| Oxide and hydroxide | | 7 |
| Metal including alloys, all forms | | 7 |
| Cobalt: | | |
| Oxide and hydroxide | | 3 |
| Metal including alloys, all forms | | 108 |
| Columbium and tantalum, tantalum metal, including alloys, all forms | kilograms | 19 |
| Copper: | | |
| Ore and concentrate | | 1,595 |
| Metal including alloys, all forms | | 37,243 |
| Gold medal, unworked or partly worked | troy ounces | 2,701 |
| Iron and steel: | | |
| Ore and concentrate | thousand tons | 1,235 |
| Metal: | | |
| Scrap | do | 234 |
| Pig iron including spiegeleisen | do | 110 |
| Sponge iron, powder and shot | | 1,582 |
| Ferroalloys | | 6,899 |
| Ingots and other primary forms | thousand tons | 1,599 |

See footnotes at end of table.

## Table 3.—Argentina: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1973 |
|---|---|---|
| **METALS—Continued** | | |
| Iron and steel—Continued | | |
| Metal—Continued | | |
| Semimanufactures: | | |
| Common steel: | | |
| Bars and rods | thousand tons | 8 |
| Angles, shapes, sections | do | 20 |
| Universals, plates, sheets | do | 238 |
| Hoop and strip | do | 5 |
| Rails and accessories | | 753 |
| Wire | | 111 |
| Tubes, pipes, fittings | thousand tons | 7 |
| Castings and forgings | | 239 |
| High carbon and alloy steel, all forms | thousand tons | 35 |
| Lead: | | |
| Ore and concentrate | | 30 |
| Oxides | | 7 |
| Metal including alloys, all forms | | 681 |
| Magnesium metal including alloys, all forms | | 451 |
| Manganese: | | |
| Ore and concentrate | | 55,919 |
| Oxides | | 458 |
| Metal | | 61 |
| Mercury | 76-pound flasks | 560 |
| Molybdenum: | | |
| Ore and concentrate | | 44 |
| Metal including alloys, all forms | | 8 |
| Nickel metal including alloys, all forms | | 983 |
| Platinum-group metals and silver: | | |
| Platinum group | troy ounces | 2,283 |
| Silver | do | 157,796 |
| Rare-earth metals and compounds | | 12 |
| Selenium, elemental | | 10 |
| Tellurium | kilograms | 100 |
| Tin: | | |
| Ore and concentrate | long tons | (1) |
| Oxides | do | (1) |
| Metal including alloys, all forms | do | 1,513 |
| Titanium: | | |
| Ore and concentrate | | 1,815 |
| Oxides | | 1,326 |
| Metal including alloys, all forms | do | 16 |
| Tungsten metal including alloys, all forms | | 7 |
| Uranium metal including alloys, all forms | kilograms | -- |
| Zinc: | | |
| Ore and concentrate | | 1,105 |
| Oxide | | 75 |
| Metal including alloys, all forms | | 3,919 |
| Zirconium ore and concentrate | | 192 |
| Other: | | |
| Ore and concentrate, n.e.s | | 1,024 |
| Ash and residue containing nonferrous metals | | -- |
| Oxides, hydroxides and peroxides of metals, n.e.s | | 382 |
| Metals including alloys, all forms: | | |
| Metalloids | | 3,988 |
| Pyrophoric alloys | kilograms | 348 |
| Base metals, n.e.s | do | 2,248 |
| **NONMETALS** | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | | 245 |
| Grinding and polishing wheels and stones | | 82 |
| Asbestos | | 13,484 |
| Barite and witherite | | 86 |
| Bromine | | 46 |
| Cement | | 3,263 |
| Chalk | | 211 |
| Clays and clay products, including all refractory brick: | | |
| Crude clays, n.e.s.: | | |
| Bentonite | | 5 |
| Fireclay | | 96 |
| Kaolin | | 15,513 |
| Andalusite, kyanite, sillimanite | | 555 |
| Other | | 613 |
| Products: | | |
| Refractory, including nonclay bricks and cement | | 21,351 |
| Boron materials: | | |
| Borates | | 165 |
| Boric acid | | 6 |
| Nonrefractory | | 1,445 |

See footnotes at end of table.

## Table 3.—Argentina: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1973 |
|---|---|---|
| **NONMETALS—Continued** | | |
| Cryolite and chiolite | | 9 |
| Diamond: | | |
| Gem | thousand carats | -- |
| Industrial | value, thousands | $352 |
| Powder | thousand carats | 180 |
| Diatomite and other infusorial earth | | 1,651 |
| Feldspar and fluorspar | | 2,619 |
| Fertilizer materials: | | |
| Crude: | | |
| Nitrogenous | | 11,652 |
| Manufacturer: | | |
| Nitrogenous | | 11,661 |
| Phosphatic: | | |
| Thomas slag | | -- |
| Other | | 41,049 |
| Potassic | | 20,466 |
| Mixed | | 39,600 |
| Ammonia | | -- |
| Graphite, natural | | 345 |
| Gypsum and plasters | | -- |
| Iodine | | 65 |
| Lime | | -- |
| Magnesite | | 18,068 |
| Mica: | | |
| Crude, including splittings and waste | | 28 |
| Worked, including agglomerated splittings | | 14 |
| Pigments, mineral: | | |
| Natural, crude | | 15 |
| Iron oxides, processed | | 193 |
| Precious and semiprecious stones, except diamond | thousand carats | 29,290 |
| Pyrite, (gross weight) | | 31 |
| Salt and brine | | 14 |
| Sodium and potassium compounds, n.e.s.: | | |
| Caustic soda | | 44,778 |
| Caustic potash, sodic and potassic peroxides | | 545 |
| Sodium carbonate, natural and manufactured (soda ash) | | 150,251 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude | | 2,534 |
| Worked | | 29 |
| Dolomite | | 3,964 |
| Gravel and crushed rock | | 3,187 |
| Quartz and quartzite | | 284 |
| Sand, excluding metal bearing | thousand tons | 68 |
| Sulfur: | | |
| Elemental: | | |
| Other than colloidal | | 71,545 |
| Colloidal | | 67 |
| Sulfuric acid | | 19 |
| Talc, steatite, soapstone, pyrophyllite | | 257 |
| Other nonmetals, n.e.s.: | | |
| Crude | | 565 |
| Slag, dross and similar waste, not metal bearing, from iron and steel manufacture | | 371 |
| Oxides, hydroxides and peroxides of strontium, barium or magnesium | | 108 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Asphalt and bitumen, natural | | 71 |
| Carbon black | | 1,036 |
| Coal, all grades, including briquets | thousand tons | 782 |
| Coke and semicoke | do | 4 |
| Oxygen, nitrogen, hydrogen and rare gases | | 2 |
| Peat | | 80 |
| Petroleum: | | |
| Crude | thousand 42-gallon barrels | 17,601 |
| Refinery products: | | |
| Gasoline | do | 531 |
| Kerosine | do | 226 |
| Distillate fuel oil | do | 585 |
| Residual fuel oil | do | 2,937 |
| Lubricants | do | 24 |
| Other: | | |
| Liquefied petroleum gas | do | 13,761 |
| Nonlubricating oils, n.e.s | do | 21 |
| Other | do | 62 |
| Mineral tar and other coal-, gas-, or petroleum-derived crude chemicals | | 75,642 |

[1] Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Aluminios Argentinos, S.A. (ALUAR), began operating the country's first aluminum smelter at Puerto Madryn, near Buenos Aires, at the initial rate of 36,000 tons per year. ALUAR planned to double the rate of production during 1975, and in 1976, the plant is expected to reach its full design capacity of 140,000 tons per year. Production was based on imported alumina.

**Copper.**—Compañía Minera Aguilar, S.A. (CMA), began work on a pilot plant at the Pachón copper deposits in San Juan Province and constructed a road from the site to La Junta, approximately 220 kilometers distant. The company plans to begin commercial output at Pachón in 1980. In addition to further exploration activities in San Juan Province, CMA carried out exploration in Mendoza and Neuguén Provinces where large deposits of copper, molybdenum, and other minerals are believed to exist.

**Iron and Steel.**—Steps were taken in 1974 to improve the availability of iron ore supplies and to expand Argentina's iron and steel production facilities. Production of crude steel increased 9% from 2.2 million tons in 1973 to 2.4 million tons in 1974, and pig iron output increased by 33% to 1.1 million tons during 1974. The domestic industry planned to raise crude steel output to 6 million tons per year by 1977 and to 10 million tons per year by 1980. Negotiations were carried out with Bolivia and Brazil for future supplies of iron ore, and mining equipment was obtained from Sweden to be used in a new mine at Sierra Grande, in southern Argentina. Production at Sierra Grande is expected to average 3.5 million tons of iron ore per year.[4]

New furnaces were installed at Acindar, Santa Rosa, and Zapla; and a continuous casting plant was built at Acindar. Aceros Bragado, S.A., acquired a steel sheet rolling mill, and Dálmine Siderca S.A.I.C. reportedly obtained a direct reduction plant and a seamless steel tube mill. Expansions were planned at several other mills. FM requested international bids for the construction of a steel mill in Argentina rated at 2.5 million to 3 million tons per year, to begin production by yearend 1978. The State will be the main stockholder in the planned steel mill.[5]

**Uranium.**—Prospecting for uranium reportedly resulted in a discovery of unknown size in the northwest part of the country. Comisión Nacional de Energía Atomica (CNEA) announced plans to develop the deposit at Sierra Pintado in Mendoza Province.

During the year, construction activities were completed at one nuclear powerplant and started at another. The 319-megawatt Atucha nuclear plant, South America's first, began supplying Argentina with electricity. The plant is located on the Río Paraná about 100 kilometers northwest of Buenos Aires. A site at Embalse, near Córdoba, was chosen for the country's second nuclear powerplant, and CNEA commenced the construction of a 600-megawatt plant there in 1974. During the year, CNEA reviewed plans for a third nuclear powerplant, which will probably be built near Atucha and have a capacity identical to the Embalse plant.

**Other Metals.**—The State mining company Yacimientos Mineros de Aguas de Dionisio (YMAD) prepared plans to begin producing 25,000 tons per year of manganese concentrates along with 600 kilograms of gold and 2,500 kilograms of silver from the Farallon Negro deposits in Catamarca Province in 1975. YMAD's proven reserves at the deposit will last 12 years at anticipated production rates. The company was conducting exploratory activities at Alto de la Blend and Bajo de la Alumbrera.

A plant may be built in San Luis Province to process low-grade tungsten ore. The local government solicited bids for the construction of the plant near La Toma, about 650 kilometers west of Buenos Aires. CMA produced 49,835 tons of lead concentrate, 1.9 million troy ounces of silver, and 86,800 tons of zinc concentrate in 1974.

### NONMETALS

**Cement.**—Near yearend, the new 400,000-ton-per-year-capacity cement plant in Buenos Aires Province began operations, increasing Argentina's installed produc-

[4] Mining Journal. Crushers for Argentina. V. 282, No. 7729, Mar. 8, 1974, p. 178.
[5] Mining Journal. Argentine Steelworks Tenders. V. 283, No. 7256, Sept. 13, 1974, p. 222.

tion capacity by 4.9% to nearly 8.6 million tons per year. More than three-fourths of the industry's capacity was located in the Provinces of Buenos Aires and Córdoba. Argentina's portland cement plants operated at 63% of their capacity in 1974, producing 5.4 million tons of cement. In addition, more than 42,200 tons of white cement was produced during the year. The industry employed more than 8,000 workers.

Major cement consuming areas were the capital city and the Provinces of Buenos Aires, Córdoba, Mendoza, and Santa Fe. Nearly all domestic shipments of cement were handled by highway and railroad vehicles, and less than 1% of the consignments was transported by waterway.[6]

**Clays.**—*Alunite.*—Two deposits of alunite have been discovered in Chubut Province. One of the discoveries was made near Camarones, and the other deposit was discovered at Alto Río Senguerr. Estimates of reserves have not been made.[7]

**Fertilizer Materials.**—An agreement was signed during 1974 by Argentina and Bolivia that called for feasibility studies concerning the construction of a nitrogenous fertilizer plant that would supply both countries. The negotiators envisaged a binational plant to be built near the Argentine-Bolivian border, producing about 1,000 tons per day of ammonia and a similar volume of urea.

## MINERAL FUELS

**Coal and Coke.**—Production of washed coal by Yacimientos Carboníferos Fiscales (YCF) totaled 625,647 tons in 1974, an increase of 38% above that of 1973. The washed coal output was 53% of YCF's gross mine output. During the year, railroads transported 523,625 tons of coal from the Río Turbio mines in southwestern Argentina to the port of Río Gallegos where 437,462 tons were shipped by water to consumers in Buenos Aires and San Nicolás. Argentina imported 906,088 tons of bituminous and 1,000 tons of anthracite coal in 1974; the coal imports were valued at $55.2 million. During the year, 3,147 tons of coke was imported from Belgium.[8] Poland signed an agreement whereby they would assist YCF in developing the Río Turbio mines and in exploring in other areas.

**Petroleum and Natural Gas.**—YPF and other oil companies continued to develop Argentina's petroleum and natural gas industries. Yearend reserves of crude oil were estimated at 2.3 billion barrels, down 154 million barrels from that of yearend 1973; reserves of natural gas were estimated at 7.1 trillion cubic feet, up 1.1 trillion cubic feet from that of 1973. Nearly all exploration operations were conducted by YPF crews or by private companies under contract to the Government oil company. An average of 7 geologic, 1 gravity, and 22 seismic groups were active during the year. Marine surveys were carried out offshore Río Colorado, the Río Salado Basin, and Tierro del Fuego. YPF submitted the most favorable bid to Ecuador for the right to explore an area of 2,000 square kilometers in that country.

In Argentina, 606 oil wells totaling 1.3 million meters were drilled in 1974; the number of wells drilled exceeded the previous year by only 9 wells.[9] YPF's offshore drilling program was delayed when a jack-up rig sank while in tow to Argentina from the United States. Another rig was under construction in a French shipyard and was scheduled for delivery in 1976.[10] YPF made three oil discoveries in Mendoza Province near the Chilean border; each flowed more than 500 barrels of oil per day, and the productive depths reportedly ranged from 1,414 to 3,146 meters.

During 1974 the Government took over the marketing of all petroleum and petroleum products in the country. Six private retailing companies, including subsidiaries of Cities Service Co. and Exxon Corp., were affected. The Government action did not affect refinery operations by foreign companies.

Argentina's petroleum refinery throughput capacity totaled 720,718 barrels per day in 1974, the third largest in South America, behind that of only Venezuela

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[6] Asociación de Fabricantes de Cemento Portland, (Buenos Aires). La Industria Argentina del Cemento Portland, Anuario 1974. May 1975, pp. 1–48.

[7] Work cited in footnote 2.

[8] Minera (Buenos Aires, Argentina). Yacimientos Carboníferos Fiscales Dio a Conocer el Boletín Estadístico del Año 1974. (Yacimientos Carboníferos Fiscales Published 1974 Statistical Bulletin). V. 13, No. 146, April 1975, pp. 37, 39.

[9] American Association of Petroleum Geologists Bulletin. Petroleum Developments in South America, Central America, and Caribbean Area in 1974. V. 59, No. 10, October 1975, p. 1758.

[10] The Petroleum Publishing Co. International Petroleum Encyclopedia 1975. Tulsa, Oklahoma. P. 180.

and Brazil. YPF's plants accounted for approximately 66% of the total capacity, and the company's 289,000-barrel-per-day refinery at La Plata near Buenos Aires was the largest in the country.[11] Approximately 88% of the oil processed at Argentina's refineries was from domestic sources. Refinery operations averaged 465,300 barrels of oil per day in 1974, down 6,000 barrels per day from that of 1973. Argentina's refineries could not satisfy the country's demand for petroleum products, and significant quantities of fuel oil, gas oil, gasoline, liquefied petroleum gas (LPG), and lubricants were imported. In 1974 YPF revealed its plans for the construction of a $300 million, 150,000-barrel-per-day refinery on the coast near Bahía Blanca. The new plant is to be completed by yearend 1978. YPF also developed plans for a 200,000-ton-per-year lubricating oil plant for the Punta Alta area, located about 24 kilometers south of Bahía Blanca.

Sales of petroleum products decreased approximately 4% during 1974, with gains in sales of gas oil, kerosine, LPG, and lubricants. Sales of aviation gasoline and diesel oil recorded the largest declines, 26% and 20%, respectively.

YPF and the provincial government of Chubut agreed to carry out a feasibility study for a refinery and petrochemical plant to be supplied by the San Jorge oilfields. Petrochemical plants were being built during the year at two sites in Argentina. An ethane cracking plant was under construction at the Petroquimica Bahía Blanca (PBB) plant site in Bahía Blanca. The plant was scheduled to begin producing ethylene and propylene in 1975. Petroquimica General Mosconi (PGM) readied its aromatics plant for production in La Plata. Output from the PGM plant will include benzene, cyclohexane, toluene, xylene, and higher aromatics.[12]

YPF constructed a large-diameter, crude oil pipeline from the Puerto Rosales marine petroleum terminal to the La Plata petroleum refinery, a distance of about 650 kilometers. This 81-centimeter trunkline, the country's largest, has a throughput capacity of 240,000 barrels per day that can be expanded to 500,000 barrels per day.[13]

Sales of natural gas by Gas del Estado, the state-owned gas company, totaled 256 billion cubic feet in 1974, an increase of 18 billion cubic feet or 7.5% from that of 1973.

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[11] Oil and Gas Journal. Worldwide Refining. V. 72, No. 52, Dec. 30, 1974, p. 111.
[12] Chemical Week. Argentine Aromatics Supplies. V. 114, No. 5, Jan. 30, 1974, p. 28.
[13] World Petroleum Report 1975. South America. Mona Palmer Publishing Co., Inc., New York, 1975, v. 21, p. 158.

# The Mineral Industry of Australia

By Charlie Wyche [1]

A contrast of both favorable and unfavorable events characterized Australia's mining industry in 1974. The rapid increase in metal prices during most of the year more than offset the decline in the final quarter. The price drop at yearend was also partly compensated for by devaluation of the Australian dollar. The overall price rise brought increased production and revenue to operating mines. According to early estimates, the $2.90 billion [2] value of mine and quarry production, together with value added by local smelting and processing, credited the mineral industry with products valued at $4.1 billion. This figure represented 5.3% of the $78 billion (adjusted gross national product (GNP). Since 1969 value of mineral output in constant dollars has almost doubled. The advance was achieved despite a decline in exploration, increased inflation, environmental difficulties, and serious shortages of workmen, equipment, and supplies.

Australia ranks among the world's five major producers of bauxite, iron, tin, silver, lead, zinc, and manganese and has 24% of the world's uranium reserves. It is the world's 10th largest producer of black coal, and its brown coal resources in Victoria are probably the world's largest. With the development of phosphate deposits in the Mount Isa Area of Queensland, Australia will rank among the three largest world producers of this mineral. Of the mineral commodities produced in Australia during 1974, iron ore, bauxite, alumina, copper, and coal showed significant increases. These commodities accounted for over 70% of the total value of the Nation's mineral production in 1973, the most recent year for which complete value data are available. The 10 leading mineral commodities or categories, in order of value, in million dollars, were as follows: Coal, 488.1; iron ore 427.5; crude petroleum, 380.2; copper, 267.9; construction materials, 196.6; lead in ore and concentrate, 110.9; zinc in ore and concentrate, 97.1; mineral sands (including rutile, zircon, and ilmenite), 63.0; gem stones 47.3; and tin-in-concentrate, 43.4.

Although all six States and the Northern Territory contributed to the mineral output, Western Australia with its large iron ore, nickel, and gold industries furnished 24.5% of the total value of Australia's mineral production. The iron ore production value increased from $583 million to $654 million, a rise of 12%.

Queensland's aluminum raw materials, base metals, and coal resources ranked that State in second place with 23.7%, and New South Wales with its large base metals and coal production was a close third, accounting for 20.5% of the total value. Victoria, with substantial production of brown coal, was fourth with 17.5%. Tasmania, South Australia, and the Northern Territory with a wide variety of minerals such as copper, tin, zinc, and bauxite contributed the remainder.

Aided by a continuation of good economic conditions in world markets which developed late in 1973, exports of primary mineral products (excluding gold) increased by 9% to a record $2.2 billion in 1974. The value of gold shipments was excluded in accordance with international standards, whereby shipments of refined gold and bullion are not classified as merchandise trade. The increase was attributed to higher prices and increased shipments of iron ore and pellets, nickel, alumina, and black coal, which accounted for more than 65% of total mineral ex-

[1] Physical scientist, Division of Nonferrous Metals.
[2] Unless otherwise indicated, values have been converted from Australian dollars ($A) to U.S. dollars at the rate of $A1 = US$1.27.

ports. Exports of iron ore from Western Australia increased in quantity from 64 million tons in 1973 to 75 million tons in 1974; the value of shipments increased from $524 million to $588 million. Production of nickel in concentrates increased in value by 25%, from $103 million to $129 million. Higher export values were also reported for refined copper, tin, manganese ore, and crude oil.

Although Australia exported minerals and metals to more than one hundred countries in 1974, Japan, the United Kingdom, United States, and countries of the European Economic Community (EEC) accounted for 90% of total mineral exports. Japan alone received more than 85% of the total iron ore and black coal production. Australia continued to import substantial quantities of phosphate rock, sulfur, asbestos, and industrial diamond. Although the population and economy were expanding, the value of mineral imports increased nominally over the $250 million in 1973.

Exploration expenditures for petroleum increased from $136 million in 1973 to about $146 million in 1974. Private industry spent about $90 million on exploration for minerals other than petroleum, compared with $85 million in 1973.

## PRODUCTION

Australia's mineral production in 1974 included 51 basic commodities, 24 of which were metallic, 23 nonmetallic and construction materials, and 4 fuel minerals. Despite labor and environmental problems, production gains were recorded in more than half of the commodities, and the total value of minerals produced was 20% greater than that in 1973. Major commodities that showed decreases were lead, gold, silver, tin, and zinc.

**Table 1.—Australia: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite, gross weight ---- thousand tons -- | 14,437 | 17,596 | 20,065 |
| Alumina ---- do ---- | 3,068 | 4,025 | 4,897 |
| Metal, refined ---- do ---- | 206 | 207 | 219 |
| Antimony, mine output (content of antimony and lead concentrates) ---- | 1,366 | 1,486 | 1,353 |
| Beryllium, beryl, gross weight ---- | 62 | 162 | • 170 |
| Bismuth, mine output, metal content ---- | r 389 | 454 | • 870 |
| Cadmium: | | | |
| Mine output, metal content ---- | 1,625 | 1,584 | • 1,300 |
| Smelter output (refined) ---- | 720 | 678 | 759 |
| Cobalt, mine output (content of zinc and nickel concentrates) -- | 770 | 768 | • 780 |
| Columbium-tantalum concentrate, gross weight [1] ---- | r 558 | 441 | • 440 |
| Copper: | | | |
| Mine output, metal content ---- | 186,812 | 220,352 | 255,550 |
| Blister: | | | |
| Primary ---- | r 145,341 | 162,218 | 195,598 |
| Secondary ---- | 4,173 | 4,656 | 4,784 |
| Refined: | | | |
| Primary ---- | r 139,110 | 144,514 | 162,096 |
| Secondary ---- | 34,637 | 33,075 | 13,439 |
| Gold: | | | |
| Mine output, metal content ---- troy ounces -- | 754,866 | 554,278 | 520,102 |
| Refined (excluding recovery from scrap) ---- do ---- | 652,595 | 487,469 | 415,869 |
| Iron and steel: | | | |
| Iron ore, gross weight ---- thousand tons -- | 64,401 | 84,812 | 96,673 |
| Metal: | | | |
| Pig iron ---- do ---- | 6,491 | 7,658 | 7,250 |
| Ferroalloys: [2] | | | |
| Ferrochromium, high carbon ---- | 1,396 | | |
| Ferromanganese, high carbon ---- | 56,681 | NA | NA |
| Ferrosilicon ---- | 9,271 | | |
| Silicomanganese ---- | 16,607 | | |
| Total ---- | 83,905 | NA | NA |
| Crude steel ---- thousand tons ---- | 6,743 | 7,684 | 7,755 |
| Steel semimanufactures [3] ---- do ---- | 5,165 | 6,724 | 6,820 |
| Lead: | | | |
| Mine output, metal content ---- | 396,001 | 404,786 | 377,256 |

See footnotes at end of table.

## Table 1.—Australia: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| METALS—Continued | | | |
| Lead—Continued | | | |
| Metal: | | | |
| Primary: | | | |
| Bullion, for export | 139,977 | 149,923 | 147,224 |
| Refined | 179,743 | 190,355 | 192,757 |
| Total | 319,720 | 340,278 | 339,981 |
| Secondary (excluding remelt) | 29,140 | 30,087 | e 32,000 |
| Manganese ore, gross weight thousand tons | 1,165 | 1,522 | 1,522 |
| Mercury 76-pound flasks | r 17 | 16 | e 16 |
| Molybdenum, mine output, metal content | 4 | e 1 | e 11 |
| Nickel: | | | |
| Mine output, metal content | 35,548 | 40,595 | 43,155 |
| Metal, refined e | 16,500 | r 20,000 | 20,000 |
| Platinum-group metals e 4 troy ounces | 1,400 | 1,950 | 2,250 |
| Rare-earth minerals, monazite concentrate, gross weight | 5,107 | 4,286 | 3,817 |
| Selenium 5 kilograms | 36,550 | e 40,000 | e 43,000 |
| Silver: | | | |
| Mine output, metal content thousand troy ounces | 21,888 | 22,423 | 21,615 |
| Refined do | 8,491 | 7,765 | 7,814 |
| Tin: | | | |
| Mine output, metal content long tons | 11,808 | 10,105 | 9,990 |
| Smelter output (primary only) do | 6,916 | 6,795 | 6,608 |
| Titanium concentrates, gross weight: | | | |
| Ilmenite | 707,413 | 719,601 | 824,990 |
| Leucoxene | 10,730 | 11,097 | |
| Rutile | 313,139 | 335,231 | 322,485 |
| Tungsten, mine output, metal content | r 1,451 | 1,196 | e 1,100 |
| Zinc: | | | |
| Mine output, metal content | 507,055 | 475,458 | 453,503 |
| Smelter: | | | |
| Dust | 8,332 | 7,928 | r 8,000 |
| Primary | 295,030 | 297,174 | 276,831 |
| Secondary | 8,660 | 6,983 | 6,969 |
| Zirconium concentrate, gross weight | r 356,694 | 356,829 | 368,818 |
| NONMETALS | | | |
| Abrasives, natural: | | | |
| Beach pebble | 2,068 | NA | NA |
| Garnet (sales) | 537 | NA | NA |
| Asbestos | 16,838 | 41,472 | e 31,000 |
| Barite | 26,288 | 10,032 | e 6,100 |
| Cement, hydraulic thousand tons | r 4,937 | 5,247 | 5,205 |
| Clays: | | | |
| Bentonite and bentonitic clay | 394 | r e 400 | e 400 |
| Brick clay and shale thousand tons | 8,065 | 8,577 | e 8,600 |
| Cement clay and shale do | 309 | NA | NA |
| Damourite clay (sales) | 405 | NA | NA |
| Fire clay thousand tons | 277 | r e 300 | e 300 |
| Fuller's earth e | r 100 | 100 | 100 |
| Kaolin and ball clay | 65,663 | r e 70,000 | e 70,000 |
| Other thousand tons | 594 | e 600 | e 600 |
| Diatomite | 1,537 | 4,821 | e 700 |
| Feldspar | 3,133 | 2,867 | e 2,300 |
| Fertilizer materials, crude, phosphate rock | 1,051 | 5,000 | 5,000 |
| Fluorspar | 877 | 1,568 | e 300 |
| Gem stones e value, thousands | r $42,100 | $75,600 | NA |
| Gypsum | 959,095 | 1,160,514 | e 1,000,000 |
| Kyanite and sillimanite (sillimanite only) | 575 | 642 | e 700 |
| Lime 6 | 769,327 | r e 770,000 | e 770,000 |
| Lithium minerals, petalite, gross weight | 1,071 | 221 | e 200 |
| Magnesite | 19,995 | 23,176 | e 20,000 |
| Perlite, crude | 1,807 | NA | NA |
| Pigments, natural mineral, ocher | 599 | NA | NA |
| Pyrite, including cupreous: | | | |
| Gross weight | 243,694 | 244,798 | 224,251 |
| Sulfur content | 113,867 | 116,968 | 107,236 |
| Salt thousand tons | 7 3,340 | 7 4,058 | e 4,800 |
| Sand and gravel: | | | |
| Construction sand do | 19,884 | NA | NA |
| Gravel do | 12,771 | NA | NA |
| Stone: | | | |
| Dolomite do | 392 | 393 | e 400 |
| Limestone for cement do | 7,420 | 10,835 | NA |
| Limestone for other uses do | 3,074 | | NA |
| Silica in the form of quartz, quartzite, and glass sand do | 1,058 | NA | NA |
| Other: | | | |
| Crushed and broken do | 51,115 | NA | NA |
| Dimension do | 8 318 | NA | NA |
| Unspecified do | e 30,977 | NA | NA |

See footnotes at end of table.

Table 1.—Australia: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Sulfur: | | | | |
| Byproduct [10] | thousand tons | 351 | 477 | e 496 |
| Sulfuric acid (from all source materials) | do | 1,953 | 2,383 | e 2,600 |
| Talc, soapstone, pyrophyllite | | r 56,148 | 64,808 | e 86,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Coal: | | | | |
| Bituminous and subbituminous | thousand tons | 59,689 | 67,867 | 70,449 |
| Lignite | do | 23,697 | 24,676 | 27,244 |
| Total | do | 83,386 | 92,543 | 97,693 |
| Coke: | | | | |
| Metallurgical | do | 4,591 | 4,945 | 5,114 |
| Gashouse (including breeze) | do | 85 | NA | NA |
| Total | do | 4,676 | 4,945 | 5,114 |
| Fuel briquets | do | 1,214 | 1,182 | 1,156 |
| Gas, natural, marketable production | million cubic feet | 112,580 | 144,754 | 165,164 |
| Natural gas liquids | thousand 42-gallon barrels | 13,920 | r e 17,200 | e 17,300 |
| Petroleum: | | | | |
| Crude | do | 119,513 | 142,282 | 140,936 |
| Refinery products: | | | | |
| Aviation gasoline | do | 270 | 252 | 440 |
| Other gasoline | do | 67,376 | 75,113 | 76,225 |
| Jet fuel | do | 10,265 | 11,290 | 12,937 |
| Kerosine | do | 981 | 1,377 | 1,698 |
| Distillate fuel oil | do | 37,160 | 44,167 | 45,598 |
| Residual fuel oil | do | 32,286 | 33,852 | 32,461 |
| Lubricants | do | 2,761 | 2,648 | 2,703 |
| Other: | | | | |
| Refinery gas | do | r 786 | 887 | e 930 |
| Liquefied petroleum gas | do | 3,981 | 4,145 | 3,914 |
| Solvents | do | 1,409 | 1,705 | 1,827 |
| Bitumen | do | 2,925 | 2,950 | 2,849 |
| Unspecified | do | 7,246 | 9,378 | e 8,000 |
| Refinery fuel and losses | do | r 16,190 | 16,964 | 17,583 |
| Total | do | r 183,636 | 204,728 | 207,165 |

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Exports (production not officially reported).
[2] Data are for year ended November 30 of that stated.
[3] Data are for year ended November 30 of that stated for plants owned by The Broken Hill Pty. Co. Ltd.
[4] Figures represent estimated refinery recovery from nickel concentrates exported to Japan from Kambalda.
[5] Partial figure; output by Peko-Wallsend Ltd. only.
[6] Data are for year ended June 30 of that stated.
[7] Excludes production from Victoria, for which data are not available.
[8] Excludes production from Northern Territory, Australian Capital Territory, and Queensland.
[9] Excludes production from Western Australia.
[10] Sulfur content of materials obtained as a byproduct of nonferrous metallurgical operations and oil refining.

## TRADE

The trade data in tables 2 and 3, provided by the Commonwealth Bureau of Census and Statistics, cover the official July 1 to June 30 yearly reporting period; therefore, the data are not comparable with calendar year data presented elsewhere in this review.

## Table 2.—Australia: Exports and reexports of mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1971–72 | 1972–73 | Principal destinations, 1972–73 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite, gross weight [2] thousand tons | 5,563 | 6,701 | Japan 3,457; West Germany 1,613; Italy 454. |
| Alumina, gross weight ____ do ____ | 2,460 | 2,592 | NA. |
| Metal: | | | |
| Scrap | 2,823 | 1,640 | Japan 1,503; Thailand 57; Taiwan 37. |
| Unwrought | 96,239 | 81,462 | NA. |
| Semimanufactures | 5,048 | 5,007 | Indonesia 1,399; New Zealand 1,113; Hong Kong 544. |
| Beryllium ore and concentrate, gross weight | 54 | 168 | United States 142; Japan 26. |
| Cadmium metal, refined, unwrought and semimanufactures | 658 | 594 | United States 197; Netherlands 186; United Kingdom 101. |
| Chromium: | | | |
| Chromite ore and concentrate, gross weight | 11 | -- | |
| Chromium oxides and hydroxides | 212 | 11 | New Zealand 10. |
| Columbium and tantalum, columbite-tantalite concentrate, gross weight ____ | 170 | 290 | United States 140; Netherlands 98; Japan 20. |
| Copper: | | | |
| Ore and concentrate, gross weight | 141,396 | 164,254 | Japan 159,775; Belgium-Luxembourg 2,858; West Germany 834. |
| Matte | 3,791 | 7,012 | All to Belgium-Luxembourg. |
| Metal including alloys: | | | |
| Copper-lead dross and speiss ____ | 1,287 | 2,817 | All to United States. |
| Copper slags and residues ____ | 132 | 18 | Mainly to United States. |
| Scrap including alloys scrap ___ | r 583 | 733 | Japan 616; United Kingdom 67; Taiwan 50. |
| Unwrought: | | | |
| Blister and cement | 5,869 | 7,797 | Japan 7,728; United Kingdom 69. |
| Other, unalloyed | 56,517 | 49,967 | United Kingdom 23,395; West Germany 13,798; France 7,268. |
| Alloyed | 17 | 64 | Japan 28; Malaysia 12; New Zealand 11. |
| Semimanufactures: | | | |
| Unalloyed | 15,307 | 7,827 | New Zealand 1,827; United Kingdom 1,295; Singapore 1,215. |
| Alloyed | 3,294 | 4,611 | Hong Kong 2,385; New Zealand 846; Singapore 491. |
| Gold: | | | |
| Ore and concentrate, metal content [3] troy ounces | r 213,352 | 61,987 | NA. |
| Metal: | | | |
| Mint bullion ____ do ____ | 108,865 | 293,207 | United Kingdom 267,601; Hong Kong 25,590. |
| Refined and unrefined bullion do ____ | 9,883 | 35,287 | Japan 34,051; New Zealand 722; United Kingdom 514. |
| Iron and steel: | | | |
| Ore and concentrate thousand tons | 50,239 | 66,294 | Japan 56,416; Italy 1,812; West Germany 1,731. |
| Metal: | | | |
| Scrap ____ do ____ | 553 | 543 | NA. |
| Pig iron and equivalent materials ____ do ____ | 528 | 687 | People's Republic of China 289; Japan 194; Italy 156. |
| Ferroalloys | 222 | 184 | New Zealand 157; Malaysia 23. |
| Steel ingots and other primary forms ____ thousand tons | 298 | 757 | West Germany 256; Republic of Korea 122; Philippines 121. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections ____ do ____ | 153 | 155 | New Zealand 50; Singapore 22; Indonesia 12. |
| Universals, plates, sheets do ____ | 271 | 351 | United States 62; New Zealand 57; United Kingdom 33. |
| Hoop and strip ____ do ____ | 6 | 10 | New Zealand 8. |
| Rails and accessories do ____ | 23 | 25 | People's Republic of China 11; New Zealand 9; Thailand 4. |
| Wire ____ do ____ | 21 | 22 | New Zealand 9; Indonesia 3; United States 2. |
| Tubes, pipes, fittings do ____ | 54 | 82 | NA. |
| Castings and forgings, rough do ____ | 2 | 2 | United States 1. |
| Total ____ do ____ | r 530 | 647 | |

See footnotes at end of table.

Table 2.—Australia: Exports and reexports of mineral commodities[1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1971–72 | 1972–73 | Principal destinations, 1972–73 |
|---|---|---|---|
| METALS—Continued | | | |
| Lead: | | | |
| Ore and concentrate, gross weight | 93,587 | 74,143 | United States 39,300; Japan 17,671; United Kingdom 11,835. |
| Slag and residue | 2,342 | 6,629 | United States 2,711; Japan 1,827; United Kingdom 876. |
| Oxides | 2,731 | 2,826 | Malaysia 857; Thailand 619; New Zealand 406. |
| Metal including alloys: | | | |
| Scrap, including alloy scrap | 183 | 263 | West Germany 107; Republic of Korea 90; New Zealand 23. |
| Unwrought: | | | |
| Bullion, lead-silver, lead content | 137,862 | 142,270 | United Kingdom 116,776; Netherlands 15,199; West Germany 10,295. |
| Refined | r 130,346 | 149,691 | United Kingdom 47,775; United States 46,480; India 26,480. |
| Alloys, antimonial and other | 3,898 | 5,412 | New Zealand 1,516; Malaysia 1,158; Philippines 744. |
| Semimanufactures | 5,137 | 3,068 | United Kingdom 1,939; Singapore 323; Republic of Korea 220. |
| Magnesium oxide | 1,696 | 1,419 | United States 946; New Zealand 296; Philippines 142. |
| Molybdenum ore and concentrate, gross weight | 1 | -- | |
| Nickel metal and alloys:[4] | | | |
| Unwrought, value, thousands | $36,452 | NA | |
| Semimanufactures | 1,137 | NA | |
| Platinum-group metals, troy ounces | 12,442 | 76,812 | Singapore 33,486; Japan 25,769; Hong Kong 15,742. |
| Rare-earth metals, monazite concentrate, gross weight | 4,793 | 4,858 | France 3,641; United Kingdom 1,178; New Zealand 39. |
| Silver: | | | |
| Concentrates and lead-silver bullion, silver content[3] thousand troy ounces | 12,776 | 13,086 | NA. |
| Mint bullion do | 6,744 | 5,570 | Japan 3,550; United Kingdom 1,794; Singapore 215. |
| Other do | 58 | 244 | United Kingdom 70; Japan 62; New Zealand 57. |
| Tin: | | | |
| Ore and concentrate, gross weight long tons | 9,103 | 11,103 | United Kingdom 7,022; Malaysia 2,611; Mexico 722. |
| Oxides do | 8 | 30 | Japan 15; United Kingdom 6; New Zealand 6. |
| Metal including alloys: | | | |
| Unwrought do | 2,139 | 3,915 | United States 2,920; New Zealand 314; Japan 246. |
| Semimanufactures do | r 467 | 86 | Papua New Guinea 29; Philippines 15; United States 11. |
| Titanium ores and concentrates, gross weight: | | | |
| Ilmenite (excluding beneficiated ilmenite) | 515,278 | 523,740 | United Kingdom 205,030; France 116,884; Japan 89,222. |
| Leucoxene | 14,325 | 18,627 | United States 17,792; Belgium-Luxembourg 287; France 180. |
| Rutile | 314,771 | 338,509 | United States 157,028; United Kingdom 51,402; Japan 29,344. |
| Tungsten ores and concentrate, gross weight: | | | |
| Scheelite | 1,789 | 1,532 | West Germany 957; United Kingdom 196; United States 130. |
| Wolframite | 736 | 836 | Japan 303; United Kingdom 261; West Germany 213. |
| Uranium and thorium ores and concentrates, excluding monazite | -- | 3 | All to West Germany. |
| Vanadium ores and concentrate | 273 | -- | |
| Zinc: | | | |
| Ore and concentrate, gross weight | 364,147 | 300,773 | Japan 147,475; Norway 33,988; United Kingdom 29,397. |
| Oxide | 3,937 | 1,315 | Indonesia 645; Philippines 195; Hong Kong 129. |

See footnotes at end of table.

Table 2.—Australia: Exports and reexports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1971–72 | 1972–73 | Principal destinations, 1972–73 |
|---|---|---|---|
| METALS—Continued | | | |
| Zinc—Continued | | | |
| Metal including alloys: | | | |
| Slag and residue | 5,809 | 5,014 | Belgium-Luxembourg 2,166; Republic of South Africa 1,427; Taiwan 885. |
| Unwrought | r 190,427 | 203,898 | United States 47,854; United Kingdom 42,576; New Zealand 20,901. |
| Semimanufactures | 1,446 | 1,333 | New Zealand 409; Hong Kong 196; Indonesia 165. |
| Zirconium ore and concentrate, gross weight, minimum 30% $Zr SiO_4$ | 364,344 | 419,457 | Japan 157,865; United States 80,651; Italy 40,530. |
| Other: | | | |
| Ore and concentrate of base metals, n.e.s value, thousands | $94,763 | $110,131 | NA. |
| Waste and scrap containing nonferrous metals | r 10,120 | 9,753 | Singapore 9,287; India 156; Thailand 105. |
| Oxides, hydroxides and peroxides of metals, strontium, barium, magnesium | 5 | 373 | New Zealand 321; Philippines 50. |
| Other value, thousands | $1,913 | $3,046 | United States $597; Philippines $449; Hong Kong $437. |
| Metals including alloys, all forms: | | | |
| Unwrought and semimanufactures: | | | |
| Magnesium, beryllium and their alloys | 9 | 30 | New Zealand 12; Japan 12. |
| Molybdenum, tungsten and their alloys | 4 | 8 | New Zealand 4; Taiwan 2; Singapore 1. |
| Base metals including alloys, all forms, n.e.s value, thousands | $80 | $602 | Japan $213; New Zealand $177; United Kingdom $51. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc value, thousands | $87 | $85 | Japan $71; New Zealand $4. |
| Dust and powder of precious and semiprecious stones do | $11 | $26 | New Zealand $11; Singapore $5; United States $4. |
| Grinding and polishing wheels and stones do | $300 | $411 | New Zealand $154; Indonesia $51; Philippines $41. |
| Asbestos, crude and fiber | 2,387 | 27,817 | Japan 25,092; Saudi Arabia 633. |
| Barite and witherite | 16,937 | 5,488 | Brunei 3,454; Singapore 1,036; New Zealand 588. |
| Cement, hydraulic | 8,006 | 9,987 | Papua New Guinea 7,297; Indonesia 843; New Caledonia 621. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays including fire clay and sillimanite | 5,000 | 5,581 | United Kingdom 2,199; Japan 2,167; New Zealand 766. |
| Products: | | | |
| Refractory: | | | |
| Bricks | 2,551 | 2,352 | New Zealand 546; Singapore 456; Indonesia 295. |
| Other value, thousands | $525 | $521 | Philippines $89; New Zealand $80; Singapore $69. |
| Nonrefractory do | $256 | $193 | Papua New Guinea $116; Fiji $29. |
| Diamond: | | | |
| Gem, not set or strung carats | 4,090 | 4,154 | New Zealand 1,671; Israel 978; Belgium-Luxembourg 855. |
| Industrial do | 91,187 | 103,151 | United States 52,878; Republic of South Africa 28,440. |
| Fertilizer materials: | | | |
| Crude, nitrogenous | 87 | 6 | NA. |
| Manufactured: | | | |
| Nitrogenous | 7,763 | 21,430 | Philippines 10,421; Malaysia 8,410; Papua New Guinea 1,546. |
| Phosphatic (excluding basic slag) | 10,557 | 5,529 | Singapore 5,284. |
| Potassic | 48 | -- | |
| Other, including mixed | 33,125 | 59,484 | Indonesia 29,907; Brazil 22,515; Philippines 6,500. |

See footnotes at end of table.

Table 2.—Australia: Exports and reexports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1971–72 | 1972–73 | Principal destinations, 1972–73 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials—Continued | | | |
| Ammonia ------ value, thousands -- | $1,735 | $774 | Republic of South Africa $391; Philippines $200; New Zealand $103. |
| Gem stones, except diamond: | | | |
| Opals ---------- value, thousands -- | $14,910 | $20,172 | Hong Kong $8,740; Japan $5,015; United States $2,593. |
| Sapphires ---------- do ---- | $3,492 | $3,358 | Thailand $1,272; United Kingdom $690; West Germany $412. |
| Other ---------- do ---- | $651 | $1,123 | West Germany $287; Hong Kong $287; United Kingdom $131. |
| Gypsum ---------- | 313,329 | 297,136 | Taiwan 46,543; Singapore 37,538; New Zealand 12,783. |
| Lime (quicklime, slaked lime, hydraulic lime) ---------- | 225 | 640 | Indonesia 406; Papua New Guinea 127; New Caledonia 82. |
| Magnesite ---------- | 59 | -- | |
| Mica, worked and articles value, thousands -- | $50 | $51 | All to New Zealand. |
| Pigments, mineral: | | | |
| Micaceous iron oxide ---------- | 36 | 38 | New Zealand 13; Fiji 9; Singapore 6. |
| Iron oxides, other ---------- | 38 | 7 | New Zealand 3; Papua New Guinea 2. |
| Pyrite, unroasted, gross weight ---------- | 111 | 15 | Indonesia 4. |
| Salt and brine ---------- thousand tons -- | 2,386 | 2,863 | Japan 2,771. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda ---------- | 272 | 465 | Fiji 260; New Zealand 145; New Caledonia 15. |
| Caustic potash ---------- | 3 | 9 | New Zealand 6. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked ---- | 731 | 1,621 | United States 1,259; Japan 268. |
| Worked ---- value, thousands -- | $6 | $28 | United States $18; Norfolk Island $5. |
| Sand, gravel, limestone flux, and other calcareous stone ---------- | 218,812 | 387,987 | Japan 336,106; United States 44,221. |
| Sulfur, sulfuric acid ---------- | 136 | 10,830 | Japan 10,675. |
| Talc, steatite, soapstone, pyrophyllite -- | 30,648 | 31,402 | Japan 18,182; Netherlands 11,017; New Zealand 2,079. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Quartz, mica, feldspar, fluorspar, cryolite, chiolite ---------- | 1,446 | 2,140 | United States 1,106; Japan 562; New Zealand 430. |
| Refractory materials, except clay and magnesite ---------- | 99 | 151 | Papua New Guinea 31; Timor 19; Philippines 19. |
| Other ------ value, thousands -- | $114 | $431 | Japan $196; New Zealand $80; West Germany $50. |
| Oxides and hydroxides of magnesium, strontium, barium ---------- | 5 | 373 | New Zealand 321; Philippines 50. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s ---------- value, thousands -- | $2,901 | $2,667 | Canada $1,042; Papua New Guinea $993; Singapore $130. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black ---------- | 16,194 | 21,694 | New Zealand 6,658; Indonesia 5,276; Malaysia 3,323. |
| Coal, bituminous, lignite and peat (including briquets): | | | |
| Bituminous coal and briquets thousand tons -- | 21,909 | 25,800 | Japan 23,095. |
| Lignite, peat and briquets thereof do ---- | 11 | 6 | All to Japan. |
| Coke and semicoke ---------- do ---- | 73 | 204 | New Caledonia 81; Netherlands 47; Venezuela 27. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels -- | 6,859 | 2,077 | Japan 1,410; New Zealand 323; United Kingdom 312. |
| Refinery products: | | | |
| Gasoline ---------- do ---- | 1,550 | 1,428 | New Zealand 893; Singapore 295; Fiji 155. |
| Jet fuel ---------- do ---- | 2,558 | 1,422 | New Zealand 547; Fiji 512; United States 273. |

See footnotes at end of table.

## Table 2.—Australia: Exports and reexports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1971–72 | 1972–73 | Principal destinations, 1972–73 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum—Continued | | | |
| Refinery products—Continued | | | |
| Kerosine | | | |
| thousand 42-gallon barrels | 235 | 246 | New Zealand 194; Fiji 33; Gilbert and Ellice Islands 11. |
| Distillate fuel oil ------ do | 3,421 | 2,436 | New Zealand 721; United Kingdom 323; Singapore 321. |
| Residual fuel oil ------ do | 1,384 | 3,408 | Japan 3,022. |
| Lubricants ------ do | 1,044 | 847 | New Zealand 344; Malaysia 138; Republic of South Africa 123. |
| Other ------ do | r 321 | 270 | New Zealand 106; Bahrain 53; Singapore 26. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | | |
| value, thousands | $76 | $1,028 | New Zealand $764; Japan $88; Malaysia $88. |

r Revised. NA Not available.

[1] Data given are for years beginning July 1; unless otherwise specified.

[2] Data given are for years beginning January 1; in the case of bauxite, figures are receipts by trading partner countries.

[3] Data from "Australian Mineral Industry. Quarterly Review—Quarterly Statistics," Bureau of Mineral Resources, Geology, and Geophysics. V. 27, No. 3, March 1975, and for years beginning March 1 of that stated.

[4] In addition to the forms of nickel listed, Australia also exported nickel ores and concentrates, but neither quantity nor value is published in a form that is separable from other commodities.

Source: Unless otherwise specified: Overseas Trade Bulletin No. 69, 1971–72, and No. 70, 1972–73, Commonwealth Bureau of Census and Statistics, Canberra, Australia, 1972 and 1974.

## Table 3.—Australia: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1971–72 | 1972–73 | Principal sources, 1972–73 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Oxide and hydroxide | 19,237 | 3,847 | Japan 820; West Germany 670; Netherlands 664. |
| Metal including alloys: | | | |
| Scrap | 701 | 997 | New Zealand 949. |
| Unwrought | 633 | 712 | United Kingdom 438; Canada 215. |
| Semimanufactures | 3,093 | 3,523 | United States 1,461; United Kingdom 1,079. |
| Antimony metal, all forms | 72 | 80 | Mainly from People's Republic of China. |
| Arsenic trioxide, pentoxide and acids | 1,116 | 1,130 | United Kingdom 380; People's Republic of China 230; Territory of South-West Africa 195. |
| Beryllium metal including alloys, all forms ------ value | $2,382 | $2,550 | United States $1,275. |
| Bismuth metal including alloys, all forms | 13 | 11 | United Kingdom 9; Japan 2. |
| Cadmium metal including alloys, all forms | 70 | 15 | North Korea 5; Yugoslavia 5; Japan 5. |
| Chromium: | | | |
| Chromite | 6,508 | 586 | All from Republic of South Africa. |
| Oxide, hydroxide and trioxide | 319 | 589 | United States 191; West Germany 177; U.S.S.R. 174. |
| Metal including alloys, all forms | 71 | 24 | France 18; Japan 3; United Kingdom 2. |
| Cobalt: | | | |
| Oxide and hydroxide | 18 | 8 | United Kingdom 5; Belgium-Luxembourg 2. |
| Metal including alloys, all forms | 68 | 128 | Zambia 73; Belgium-Luxembourg 16. |
| Copper: | | | |
| Ore and concentrate | 5 | 1 | Mainly from Fiji. |
| Copper sulfate | 2,355 | 2,593 | New Zealand 2,166. |
| Metal including alloys: | | | |
| Scrap: | | | |
| Unalloyed | r 682 | 1,434 | New Zealand 1,050; Papua New Guinea 166. |
| Alloyed | 2,057 | 1,592 | New Zealand 974; Papua New Guinea 302; Solomon Islands 175. |
| Unwrought | 81 | 630 | Israel 506; United Kingdom 78. |
| Semimanufactures | r 4,164 | 4,488 | United Kingdom 2,624; West Germany 564; Japan 538. |

See footnotes at end of table.

## Table 3.—Australia: Imports of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1971–72 | 1972–73 | Principal sources, 1972–73 |
|---|---|---|---|
| METALS—Continued | | | |
| Gold: | | | |
| Ore and concentrate, gross weight | 18 | 12 | All from Fiji. |
| Crude bullion, gold content troy ounces | 58,403 | 99,709 | Fiji 77,982; Papua New Guinea 21,459. |
| Refined bullion do | 53,845 | 5,130 | Japan 4,910. |
| Iron and steel: | | | |
| Ore and concentrate, including roasted pyrite | 5,984 | 24,988 | Canada 16,531; Philippines 8,383. |
| Metal: | | | |
| Scrap | 190 | 141 | New Zealand 66; Solomon Islands 66. |
| Sponge iron, powder and shot | 6,749 | 6,108 | Sweden 2,538; Japan 1,601. |
| Spiegeleisen | 18 | 29 | All from West Germany. |
| Ferroalloys: | | | |
| Powder: | | | |
| Ferromanganese | 1,404 | 552 | Japan 286; Republic of South Africa 121; France 102. |
| Other | 189 | 179 | Japan 106; France 30; United Kingdom 28. |
| Shot: | | | |
| Ferrochromium | 4,991 | 7,645 | Republic of South Africa 5,456; Japan 1,634. |
| Ferromanganese | 9,370 | 5,817 | Republic of South Africa 5,519. |
| Ferromolybdenum | 148 | 243 | United Kingdom 104; United States 55; Chile 38. |
| Ferrosilicon | 9,771 | 9,202 | Republic of South Africa 5,345; Norway 1,915; Japan 1,163. |
| Ferronickel | 1,029 | 1,337 | All from New Caledonia. |
| Other | r 2,631 | 2,976 | United Kingdom 1,732; Republic of South Africa 675. |
| Steel, primary forms | r 70,478 | 60,255 | Japan 48,791; United Kingdom 10,190. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 69,513 | 34,426 | Japan 17,700; United Kingdom 6,223. |
| Universals, plates, sheets | 308,275 | 221,104 | Japan 202,754. |
| Hoop and strip | 29,030 | 31,695 | Japan 25,280. |
| Rails and accessories | 28,688 | 322 | United States 169; Japan 81. |
| Wire | 9,198 | 10,541 | Japan 6,815; United Kingdom 1,380. |
| Tubes, pipes, fittings | 98,497 | 140,815 | Japan 109,035. |
| Castings and forgings, rough value, thousands | $177 | $200 | United Kingdom $136; United States $46. |
| Lead: | | | |
| Oxides | 31 | 26 | United Kingdom 12; Republic of South Africa 10. |
| Metal including alloys: | | | |
| Scrap | 465 | 412 | New Zealand 151; Papua New Guinea 146; Solomon Islands 103. |
| Unwrought and semimanufactures | 42 | 44 | United Kingdom 19; Canada 9; United States 5. |
| Magnesium metal including alloys, all forms | 1,505 | 1,498 | Norway 649; United States 395; U.S.S.R. 358. |
| Manganese: | | | |
| Ore and concentrate: | | | |
| Battery grade | 1,636 | 1,524 | All from Ghana. |
| Metallurgical grade | 3,228 | 3,346 | People's Republic of China 3,290. |
| Oxides | 969 | 1,130 | Japan 690; United States 281. |
| Metal including alloys, all forms | 717 | 721 | Japan 555; Republic of South Africa 106. |
| Mercury 76-pound flasks | 1,243 | 1,596 | Spain 435; Philippines 275; U.S.S.R. 252. |
| Molybdenum: | | | |
| Ore and concentrate | 224 | 359 | Canada 165; Chile 107; United States 66. |
| Metal including alloys, all forms: | | | |
| Wire | 9 | 6 | United States 5. |
| Other value, thousands | $188 | $82 | United Kingdom $37; United States $33. |
| Nickel: | | | |
| Ore and concentrate | 5 | -- | |
| Matte, speiss, and similar materials | 623 | 929 | Canada 928. |
| Metal including alloys: | | | |
| Scrap | 5 | 28 | All from New Zealand. |
| Unwrought | 1,348 | 1,020 | Canada 1,020. |
| Semimanufactures | 628 | 658 | United Kingdom 494. |

See footnotes at end of table.

Table 3.—Australia: Imports of mineral commodities[1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1971–72 | 1972–73 | Principal sources, 1972–73 |
|---|---|---|---|
| METALS—Continued | | | |
| Platinum-group metals and silver: | | | |
| Ore and concentrate | 65 | 21 | New Zealand 11; Fiji 10. |
| Waste and sweepings value, thousands | $69 | $230 | New Zealand $228. |
| Metals including alloys: | | | |
| Platinum group - troy ounces | 382,133 | 180,762 | Japan 96,116; United States 60,549. |
| Silver containing 75% or more silver, silver content - do | 39,148 | 77,033 | United States 37,917; Fiji 16,705; New Zealand 10,138. |
| Silicon metal | 1,950 | 2,366 | Sweden 1,012; Canada 669; France 418. |
| Tin: | | | |
| Oxides long tons | 6 | 42 | United Kingdom 37. |
| Metal including alloys: | | | |
| Scrap do | 2 | -- | |
| Unwrought do | 94 | 64 | Malaysia 63. |
| Semimanufactures do | 2,394 | 38 | Republic of South Africa 23; United Kingdom 8. |
| Tungsten: | | | |
| Ore and concentrate | -- | 1 | All from United Kingdom. |
| Metal including alloys, all forms | 13 | 11 | United States 4; United Kingdom 4; West Germany 2. |
| Zinc: | | | |
| Ore and concentrate | -- | 18 | All from Canada. |
| Oxides | 1,267 | 771 | United States 353; Canada 282. |
| Metal including alloys, all forms | r 213 | 102 | New Zealand 48; United Kingdom 38. |
| Other: | | | |
| Ore and concentrate: | | | |
| Of niobium, tantalum, titanium, vanadium, and zirconium | 1 | 1 | Mainly from United Kingdom. |
| Of base metals, n.e.s | 11,616 | 2,448 | Japan 1,100; United States 1,036. |
| Ash and residue containing nonferrous metals | 614 | 5,645 | Chile 5,000. |
| Oxides, hydroxides and peroxides of metals, n.e.s | 699 | 895 | United Kingdom 339; Norway 180; Japan 148. |
| Metals including alloys, all forms: | | | |
| Metalloids | 1,238 | 3,224 | United States 1,541; Canada 990; U.S.S.R. 619. |
| Alkali, alkaline earth and rare-earth metals | 39 | 101 | United Kingdom 50; United States 42. |
| Base metals including alloys, all forms, n.e.s | 80 | 122 | United States 68; Japan 27. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 1,188 | 1,308 | United States 735; New Zealand 236; United Kingdom 149. |
| Grinding and polishing wheels and stones | 817 | 979 | West Germany 218; Japan 183; United Kingdom 162. |
| Asbestos: | | | |
| Chrysotile | r 41,365 | 50,014 | Canada 49,881. |
| Amosite | r 10,988 | 7,587 | Mainly from Republic of South Africa. |
| Other | r 9,312 | 3,773 | Canada 3,626. |
| Barite and witherite, natural and ground | 1,660 | 1,209 | People's Republic of China 625; Indonesia 340. |
| Boron materials: | | | |
| Crude natural borates | 1,989 | 1,301 | United States 1,289. |
| Oxide and acid | 3,543 | 3,330 | United States 2,883; People's Republic of China 400. |
| Cement, hydraulic | r e 9,353 | e 8,240 | United Kingdom 4,287; Spain 1,354; West Germany 1,289. |
| Chalk | 7,785 | 8,782 | United Kingdom 4,466; France 4,312. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 65,524 | 63,139 | United States 58,893; |
| Fire clay and ball clay | 10,948 | 9,968 | United States 9,247. |
| Andalusite, mullite, chamotte, and dinas earths | 8,484 | 8,464 | Republic of South Africa 8,390. |
| Kyanite and sillimanite | 3,418 | 490 | United States 379; India 50. |
| White clays | 27,649 | 37,535 | United Kingdom 28,129; United States 9,367. |
| Other | 9,621 | 17,936 | United States 17,669. |

See footnotes at end of table.

## Table 3.—Australia: Imports of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1971–72 | 1972–73 | Principal sources, 1972–73 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Clays and clay products (including all refractory brick)—Continued | | | |
| Products: | | | |
| Refractory (including nonclay bricks) | [3]37,382 | [3]21,689 | United States 7,341; Japan 5,728; United Kingdom 5,627. |
| Nonrefractory | | | |
| value, thousands | $11,403 | $19,105 | Japan $13,769. |
| Cryolite and chiolite | 244 | 216 | Mainly from Denmark. |
| Diamond: | | | |
| Gem, not set or strung—carats | 44,016 | 59,416 | Belgium-Luxembourg 22,401; Israel 17,090; India 8,743. |
| Industrial, including dust—do | 567,075 | 807,960 | Republic of South Africa 292,199; United States 136,553; Ireland 105,607. |
| Diatomite and other infusorial earth | 7,651 | 8,641 | United States 7,346. |
| Feldspar, leucite, nepheline | 9,149 | 11,148 | Norway 5,899; Canada 2,922; Republic of South Africa 1,446. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 3,159 | 3,572 | Mainly from Chile. |
| Phosphatic—thousand tons | 1,654 | 2,282 | Nauru 1,228; Christmas Islands 684; Gilbert and Ellice Islands 331. |
| Manufactured: | | | |
| Nitrogenous | 5,766 | 13,260 | France 7,319; Japan 2,135; West Germany 1,874. |
| Phosphatic | 2,433 | 2,044 | All from Japan. |
| Potassic | 146,804 | 165,412 | United States 89,058; Canada 73,097. |
| Other, including mixed | r 15,381 | 6,271 | West Germany 5,301. |
| Ammonia—value | $3,573 | $2,550 | Japan $1,275. |
| Fluorspar | 27,212 | 15,716 | Thailand 8,862; Republic of South Africa 3,216; United Kingdom 2,968. |
| Graphite, natural | 1,160 | 1,253 | South Korea 505; People's Republic of China 344; Sri Lanka 284. |
| Gypsum and plasters | 957 | 855 | United Kingdom 448; United States 292; West Germany 108. |
| Iodine | 35 | 48 | Japan 47. |
| Lime | $14,292 | $16,575 | United Kingdom $7,650. |
| Magnesite, crude, calcined and fused | 223 | 2,174 | Japan 2,000. |
| Mica: | | | |
| Crude, including splittings and waste | 880 | 1,080 | India 456; Republic of South Africa 316; People's Republic of China 150. |
| Worked, including agglomerated splittings—value | $120,291 | $187,425 | United States $65,025; West Germany $40,800; United Kingdom $30,600. |
| Pigments, mineral: | | | |
| Natural, crude | 895 | 1,033 | Austria 454; United Kingdom 318. |
| Iron oxides, processed | 8,035 | 9,182 | West Germany 6,800; Spain 1,266. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural—value, thousands | $2,388 | $4,395 | Australia (reimported) $1,329; Thailand $933. |
| Manufactured—do | $403 | $541 | Switzerland $158; Austria $105; West Germany $94. |
| Pyrite (gross weight) | -- | 13 | All from Turkey. |
| Salt | r 42,629 | 13,545 | United Kingdom 13,309. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda—value, thousands | $13,663 | $16,530 | NA. |
| Caustic potash, sodic and potassic peroxides | 1,853 | 1,939 | Japan 774; East Germany 454; West Germany 283. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous | r 7,367 | 4,414 | Italy 4,296. |
| Slate | 198 | 309 | Italy 100; Republic of South Africa 93; Japan 59. |
| Other | r 1,468 | 1,898 | Republic of South Africa 963; Finland 56; Sweden 218. |
| Worked—value, thousands | $507 | $636 | Italy $391. |
| Dolomite | 778 | 755 | West Germany 537; United States 139. |
| Gravel and crushed rock | r 625 | 601 | Belgium-Luxembourg 306; France 166; United States 75. |
| Limestone (except dimension) | r 739,175 | 981,365 | All from Japan. |
| Quartz and quartzite | 1,000 | 696 | Sweden 333; West Germany 259. |
| Sand, excluding metal bearing | 1,537 | 827 | United States 295; New Zealand 192; Sweden 150. |

See footnotes at end of table.

## Table 3.—Australia: Imports of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1971–72 | 1972–73 | Principal sources, 1972–73 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 276,744 | 498,275 | Canada 396,492; United States 78,018. |
| Colloidal | 65 | 76 | United States 30; Netherlands 20; France 12. |
| Sulfur dioxide | 428 | 432 | Netherlands 209; Japan 190. |
| Sulfuric acid, oleum | 7 | 169 | U.S.S.R. 163. |
| Talc, steatite, soapstone, pyrophyllite | 671 | 1,373 | United States 794; People's Republic of China 250; India 182. |
| Vermiculite | 4,482 | 4,266 | Republic of South Africa 3,183; People's Republic of China 1,021. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 5,386 | 1,311 | United Kingdom 319; New Zealand 230; Republic of South Africa 195. |
| Slag, dross and similar waste, not metal bearing: | | | |
| From iron and steel manufacture | 89 | 237 | United Kingdom 224. |
| Slag and ash, n.e.s | 37 | 11 | New Zealand 7; United Kingdom 2. |
| Oxides and hydroxides: | | | |
| Magnesium | 13,424 | 16,114 | Japan 15,534. |
| Strontium and barium | 6,934 | 9,020 | Japan 8,846. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s. | | | |
| value, thousands | $252 | $281 | Japan $107; United Kingdom $101. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 906 | 1,033 | United States 554; Trinidad and Tobago 452. |
| Carbon black | 3,139 | 2,265 | United States 1,378; United Kingdom 626. |
| Coal, all types, including briquets | 14,977 | 10,101 | Republic of South Africa 8,719; United States 1,236. |
| Coke and semicoke | 987 | 874 | United States 788. |
| Peat | 41,997 | 5,361 | West Germany 4,883. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | r 68,937 | 59,108 | Kuwait 16,727; Iraq 11,753; Saudi Arabia 10,904. |
| Refinery products: | | | |
| Gasoline do | 2,746 | 4,439 | Iran 1,824; Bahrain 924; Singapore 864. |
| Jet fuel do | 232 | 270 | Singapore 183; Iran 52. |
| Kerosine do | 814 | 600 | Bahrain 248; People's Democratic Republic of Yemen 194; Iran 143. |
| Distillate fuel oil do | 3,166 | 4,073 | Singapore 1,734; Bahrain 1,627; Saudi Arabia 411. |
| Residual fuel oil do | 15,711 | 13,893 | Singapore 6,331; Bahrain 2,372; Kuwait 2,055. |
| Lubricants do | r 4 350 | 238 | United States 108; Netherlands Antilles 97. |
| Other: | | | |
| Liquefied petroleum gas do | 1 | 1 | Mainly from United States. |
| Bitumen and other residues and bituminous mixtures, n.e.s do | 22 | 29 | Singapore 23. |
| Petroleum coke do | 659 | 656 | United States 523. |
| Unspecified do | r 4,407 | 3,077 | Bahrain 2,554. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals value, thousands | $3,109 | $2,591 | United States $1,959; Singapore $316. |

r Revised. NA Not available.

[1] Data are for years beginning July 1.

[2] Partial figures. Excludes quantities valued in thousands at $2,312 in 1791–72 and $2,660 in 1972–73.

[3] Partial figures. Excludes quantities valued at $133,392 in 1971–72 and $182,825 in 1972–73.

[4] Excludes quantity valued in thousands at $1,563.

Sources: Overseas Trade, Bulletin No. 69, 1971–72 and Bulletin No. 70, 1972–73, Bureau of Statistics, Canberra, Australia, 1972 and 1974.

# COMMODITY REVIEW

## METALS

**Aluminum.**—Australia's rich bauxite deposits made a substantial contribution to the world aluminum industry in 1974. The domestic industry as a whole performed well during the year and new records were achieved in most sectors. Production of alumina was 4.9 million tons, 22% higher than that in 1973. The record production resulted mainly from expanded output at Gladstone, in Queensland, and at Gove, in the Northern Territory. Output from the refineries at Kwinana and Pinjarra in Western Australia also continued at a high level throughout 1974 chiefly because of increased production at Pinjarra, following expansion of plant facilities in mid-1973. Bauxite production in 1974 was nearly 20.1 million tons, 14% more than the record established in 1973. The total output of 9.3 million tons produced at Weipa, Queensland, was 13% above the 1973 level. This increase at Weipa was attributed to the completion in 1973 of a major expansion program to bring mining, beneficiation, and shipping facilities to a capacity of 10.5 million tons of bauxite per year. Primary aluminum production was 6% greater than that in 1973 but was less than the 1971 record output. A return to full production capacity of 223,000 tons per year was restrained in 1974 by industrial disputes at smelters, and by strikes that affected electric power supplies.

Comalco Industries Pty. Ltd., Australia's largest bauxite and alumina producer, increased output in 1974. This firm, operating at Weipa in Queensland, is owned 45% by the Kaiser Aluminum and Chemical Corp., 45% by Conzinc Riotinto of Australia, Ltd. (CRA), and 10% by the Australian public. The company produced a record of 9.3 million tons of bauxite in 1974, but some 5% less than had been planned. The lower shipments were due to strikes and overtime bans at Weipa and delays in coastal and overseas shipping. Of the total shipped, 4.0 million tons (43%) went to Gladstone for processing into alumina, 1.6 million tons (17%) was exported to Japan, and 3.7 million tons (40%) went to Europe and other areas, including 1.2 million tons to the alumina plant of Euralumina S.p.A. in Sardinia, Italy. Sales of bauxite to customers outside the company amounted to 8.5 million tons, compared with 8.2 million tons in 1973. Sales of calcined bauxite to manufacturers of abrasives continued at a high level. The second calcining kiln was brought into production in 1974 and operated satisfactorily.

Comalco's share of primary aluminum from the Bell Bay, Tasmania, and the Bluff, New Zealand, smelters amounted to 140,980 tons, an increase of 2% over production in 1973. Sales in both Australia and New Zealand were greater than those in 1973 but dropped below estimates in the final months of the year.

A proposal for the establishment of a large alumina plant in the South West Pacific region was further developed during 1974. Comalco and a number of prospective overseas participants expressed the intention to join in the establishment of such a plant. If the plan proceeds, the plant will be supplied with bauxite from Weipa.

Bauxite was produced at Jarradale and Del Park in Western Australia. These two bauxite operations in the Darling Ranges, near Perth, were operated by Alcoa of Australia Ltd. The Jarradale and the Del Park operations produced 6.0 million tons and 2.0 million tons of bauxite, respectively, in 1974. Output from Jarradale was shipped to the Kwinana refinery, and from Del Park to the Pinjarra refinery. Total bauxite reserves are about 500 million tons.

Bauxite was also produced at a major deposit located at Gove, in the Northern Territory. Gove Alumina Ltd. conducted the mining and refining operations and produced 1.5 million tons of bauxite in 1974. The alumina plant has a capacity of 1 million tons per year.

**Copper.**—The sharp rise in the price of copper during 1974 stimulated mine production and led to increased interest in copper deposits. The record 1974 production of copper in ore and concentrate was 16% more than that of 1973. Similarly, output of primary refined copper increased 12% compared with that of 1973. The gain in copper mine output was due largely to the increased ore tonnage treated by Mount Isa Mines Ltd., which accounted for about 60% of the total Australian copper production. Substantial increases in output were also recorded at the newly commissioned smelter at Tennant Creek.

Output of the principal copper produc-

ers in recent years is summarized in table 4.

In the year ending June 30, 1974, Mount Isa treated 5.3 million tons of copper ore yielding 152,500 tons of copper, an increase of 29% above the corresponding period in 1973. The near-capacity production was attained despite a cutback during the first quarter, because of a 5-week closure of the flood-damaged Mount Isa-to-Townsville railroad, which halted movement of supplies and concentrates. For a month ore production was cut by half and then gradually increased as the supply situation returned to normal. Major underground maintenance workshops were completed on several levels. Underground exploratory drilling at the Mount Isa mine continued, and copper reserves were estimated at 141 million tons.

Table 4.—Australia: Major copper industry facilities

| Facility | Production (metric tons of copper) [1] | | |
|---|---|---|---|
| | 1972 [r] | 1973 | 1974 |
| Mine: | | | |
| Mount Isa Mines Ltd | 120,208 | 118,110 | 152,510 |
| Mount Morgan Ltd | 14,240 | 8,488 | 9,587 |
| Cobar Mines Pty. Ltd | 10,203 | 8,255 | 8,720 |
| Mount Lyell Mining & Railway Co. Ltd | 26,078 | 22,532 | 23,331 |
| Electrolytic Zinc Co. of Australasia, Ltd | 2,824 | 1,262 | 1,845 |
| Tennant Creek Field | 6,710 | 8,092 | 14,773 |
| Smelters: | | | |
| Mount Isa Mines Ltd | 149,230 | 118,227 | 130,805 |
| Mount Morgan Ltd | 8,184 | 8,140 | 9,100 |
| Electrolytic Refining & Smelting Co. of Australia Pty. Ltd.[3] | 12,430 | 8,980 | 10,212 |
| Refineries: | | | |
| Mount Isa Mines Ltd | 118,228 | 118,227 | 130,805 |
| Electrolytic Refining & Smelting Co. of Australia Pty. Ltd.[2] | 27,523 | 24,240 | 28,340 |

[r] Revised.
[1] Metal content of ore for mines; primary blister copper for smelters; and primary electrolytic for refineries.
[2] Treats concentrates from Cobar Mines Pty. Ltd.

Mount Lyell Mining & Railway Co. Ltd. at Queenstown, Tasmania, produced 23,331 tons of copper in concentrate from 2.3 million tons of ore grading 1.2% copper. Total ore production from surface and underground mining operations was 112,370 tons greater than in the previous year with the proportion recovered from underground amounting to 78% of the total. The transition to full underground mining operations during the year progressed smoothly at the Prince Lyell section, which is the major underground ore body, accounting for 46% of total production. Exploration drilling continued within Queenstown mining leases throughout the year with the completion of 56 holes, totaling 25,600 feet. The drilling was largely directed towards extending and consolidating information in known ore bodies, particularly in the Prince Lyell, Cape Horn, Crown Three, and Royal Tharsis ore bodies. Reserves in all ore zones were estimated at 30 million tons of proven ore grading 1.48% copper and 10.6 million tons of probable ore grading 1.40% copper.

Cobar Mines Pty. Ltd., fully owned by BH South Ltd., treated 500,000 tons of crude ore, producing 8,720 tons of copper in 1974. The company continued development of the massive sedimentary copper and copper-zinc deposits in central New South Wales. The mineralization occurs in lenses up to 3,300 feet wide in seven main ore bodies over a 10-miles strike length. Two main shafts were deepened to 3,300 feet in 1974, and the mill capacity was expanded to 940,000 tons of ore per year. The CSA mine, currently in production north of Cobar, has estimated reserves of over 16.3 million tons grading 1.9% copper.

Kanmantoo Mines Ltd., in Kanmantoo, South Australia, also held by BH South, completed its second full year of production. Production for the year ended June 30, 1974, continued at comparable levels to 1973 when 954,000 tons of sulfide ore and 7,200 tons of oxide ore were mined at an average grade of 0.96% copper. Drilling in 1974 disclosed ore bodies of similar grade and type as the opencut, which will be mined by underground methods when the opencut ore is mined out about 1982.

Construction of a plant to treat stockpiled oxide ores was expected to be completed by March 1975. Treatment of the stockpiled oxide ore, now in excess of 560,000 tons, will require approximately 3 years.

Peko-Wallsend Ltd. operated a copper-gold mine at Mount Morgan, Queensland, and the Tennant Creek copper-gold-bismuth mines in the Northern Territory. At the Tennant Creek operations, the Warrego concentrator, rated at a capacity in excess of 770,000 tons of ore per year, treated 740,000 tons of ore during 1974. Ore reserves at the five Tennant Creek mines were over 8 million tons averaging 3% copper. During the year ended July 9, 1974, Mount Morgan Ltd. produced 9,600 tons of contained copper in 1.4 million tons of ore treated. Remaining reserves were estimated at slightly less than 4 million tons grading 0.75% copper. The new smelter at Tennant Creek also came into full operation during the year. A pilot plant based on a process patented jointly by the University of Queensland and Mt. Morgan Ltd. for the economic recovery of high-purity copper from a leach liquid was successfully operated at the Mount Morgan mine. The material treated was flue dust from the old smelting operations plus a test sample of Tennant Creek flue dust. The process leaves a bismuth-copper residue in a form acceptable for direct recovery of bismuth and copper.

**Gold.**—Despite sharp price increases from $97.81 per troy ounce in 1973 to $159.71 per troy ounce in 1974, Australia's gold production in 1974 declined for the second successive year. In Western Australia, production dropped 24% to 230,600 troy ounces. For the first time in many years, production in Western Australia was less than one-half of the national total. The lower grade ore mined by the Kalgoorlie companies, which was only one-half as rich in gold as it was in 1972–73, undoubtedly contributed to the decline. However, the shortage of suitable labor was the prime reason for the low output from existing mines. In spite of the active recruiting campaign and high unemployment rate in Australia during 1974, the large increase in new mines made it difficult to maintain a constant workforce. In Queensland and Tasmania production increased slightly.

Victoria and Western Australia were the only States in which gold was obtained from mines worked specifically as gold mines. In all other States production was from mines in which gold was either a by-product or a coproduct The main source of gold in Queensland was the Mount Morgan copper-gold ore body. The Golden Plateau N.L. mine at Cracow was the only other important producer in the State. In New South Wales virtually all gold production was from silver-lead and zinc concentrates.

In addition to increased interest in low-grade gold deposits, high ore prices stimulated interest in tailings dumps. In Western Australia, Australian Consolidated Minerals N.L. located tailings dumps estimated to contain approximately 145,000 tons with a grade of 0.73 troy ounces of gold per ton. The company also reported further tonnages of a similar grade at other locations. Lennard Oil N.L. staked 11 million tons of tailings at Canbelego, New South Wales, and at Lancefield, Western Australia. A treatment plant was set up at Canbelego to treat 100 tons per day. This site contains about 1.1 million tons of materials suitable for processing.

A gold prospect 250 miles from Port Hedland, Western Australia, was studied by Newmont Pty. Ltd. with plans to develop it at a cost of up to $30 million. Newmont is a subsidiary of Newmont Mining Corp. of the United States. The deposit, suitable for opencut mining, was estimated to contain about 3.8 million tons of ore averaging 0.28 troy ounce of gold per ton. Central Norseman Gold Corp. N.L. operated a gold mine at Norseman, 116 miles south of Kalgoorlie. In 1974, 130,000 tons of ore was treated to produce 30,948 troy ounces of gold and 22,948 troy ounces of silver. At Noble's Nob, Australian Development Ltd. operated an opencut gold mine near Tennant Creek, Northern Territory. Treatment in 1974 of 110,310 tons yielded 29,129 troy ounces of gold.

The principal gold producers and output during 1974 were as follow:

| Company | Gold produced (troy ounces) |
|---|---|
| Central Norseman Gold Corp. N.L | 30,948 |
| Golden Plateau N.L | 17,240 |
| Kalgoorlie-Lake View Pty. Ltd | 162,050 |
| Hill 50 Gold Mine N.L | 8,363 |
| North Kalgurli (1912), Ltd | 2,315 |
| Peko-Wallsend Ltd | 207,652 |

**Iron and Steel.**—The upward trend in Australia's iron and steel industry was slowed in 1974. Production increases

ranged from 1% for steel to 14% for iron ore, but pig iron output was down 5%. Domestic iron ore output increased mainly in the Pilbara region of Western Australia, where 90% of the total output was produced in 1974. During the early part of the year another firm began significant production of iron ore and iron ore pellets from a limonite deposit located at Robe River and Deepdale, in the Pilbara region. The higher production rate in 1974 reflected the substantial rise in prices for Japanese long-term contracts. The drop in pig iron production was caused by decreased output at Newcastle and Whyalla, where cutbacks implemented in late 1973 remained in effect during 1974. At Port Kembla, steel production was adversely affected by industrial disputes and by shortages of both labor and coal. Industrial disputes reduced coal stocks to less than half the normal quantity, and by midspring steelmaking activities had been curtailed substantially.

Japan imported 71 million tons of iron ore and iron pellets from Australia in 1974 and accounted for about 80% of total iron materials exported. Exports of iron ore and iron pellets to destinations other than Japan increased 2.4% to 8.4 million tons from 8.2 million tons in 1974. The increase in exports was due mainly to a buildup in shipments from the new pellet plant at Cape Lambert, which was commissioned in 1973. The iron content of the ore and pellets averaged 63.8% in 1973 compared with 64.0% in 1974.

Several new iron ore mines at Shay Gap, Sunrise Hill, and Paraburdoo in the Pilbara area began commercial production because of strong demand for ore in 1974. Commissioning of additional production capacity at Mount Whaleback and Paraburdoo should ensure substantial growth in domestic output. Small quantities of iron oxide were also produced for use in cement, gas purification, and coal washing.

The principal iron ore producers and quantities shipped in 1974 were as follow in thousand tons:

| Company | Quantity |
|---|---|
| Goldsworthy Mining Ltd., Western Australia (lump) | 7,925 |
| Hamersley Iron Pty. Ltd., Western Australia (lump, pellets) | 34,258 |
| Western Mining Corp. Ltd., (WMC), Western Australia (lump) | 582 |
| The Broken Hill Pty. Co. Ltd., (BHP), Western Australia (lump) | 2,546 |
| The Broken Hill Pty. Co. Ltd., (BHP), South Australia (lump, pellets) | 8,242 |
| Savage River Mines, Tasmania (pellets) | 2,200 |
| Frances Creek Iron Mining Corp. Ltd. Northern Territory (lump) | 494 |
| Mount Newman Iron Ore Co., Western Australia (lump) | 28,956 |

Production at Mount Tom Price and Paraburdoo mines operated by Hamersley Iron Pty. Ltd. and Kaiser Steel Corp. totaled 34.3 million tons of high-grade lump ore. The Mount Tom Price mine produced 12.7 million tons of high-grade lump ore, 6.5 million tons of high-grade fines, and 516,000 tons of low-grade fines. Total material shipments from the mine was 37.1 million tons. A major program of modification and upgrading of the Tom Price plant was carried out in 1974 and will be continued in 1975. Output at Paraburdoo mine was 7.8 million tons of high-grade lump ore, 6.4 million tons of high-grade fines, and 307,000 tons of low-grade fines. Total ore shipments were 32.8 million tons. Intensive exploration activity within the western sector of the Pilbara continued throughout 1974. Iron ore reserves at Mount Tom Price exceed 500 million tons averaging 64% iron, and an additional 150 million tons of material averages 58% iron. At Paraburdoo there were 16 ore bodies in an area extending for 15 miles.

The Broken Hill Pty. Co. Ltd. (BHP) and its wholly owned subsidiaries continued to dominate the production of iron and steel in Australia. Total iron ore production by BHP, including the company's 30% share at Mt. Newman, was 19.9 million tons, a little higher than the 19.1 million tons produced in 1973. This figure would have been higher except for periods of industrial unrest which slowed all iron ore production in the Pilbara area. Koolyanobbing production increased slightly to 2.6 million tons, but was below target because of severe rail restrictions imposed by the Western Australia Government Railways following a series of derailments on the line to Kwinana. Reduced domestic demand for Yampi and Whyalla ores caused production at those centers to drop below the 1973 total. Whyalla pellet production increased 18% to 1.9 million tons. The BHP consolidated annual reports for the years ended May 31, 1973, and May 31, 1974, summarize output of various products as follow in thousand tons:

| Commodity | Quantity | |
|---|---|---|
| | 1973 | 1974 |
| Pig iron | 7,117 | 7,551 |
| Steel ingots and billets | 7,233 | 7,705 |
| Blooms and slabs | 6,167 | 6,434 |
| Sheets, bars, billets, etc | 3,099 | 3,123 |
| Plate and strip | 2,458 | 2,751 |
| Merchant | 1,551 | 1,730 |
| Rod | 545 | 578 |
| Narrow cold-rolled strip | 111 | 96 |
| Tinplate | 243 | 243 |

Although production was higher in 1974, several major problems held increases for both iron and steel below expectations. These problems included a series of strikes at the beginning of the year over steelworkers' bonus payments and were compounded by power restrictions caused by industrial disputes in New South Wales.

Operations at Newcastle and Port Kembla were also seriously affected by a strike of metal trade employees. Further reductions in iron and steel output resulted from a shortage of coal. Coal stocks at the steelworks were depleted to the extent that operations had to be severely curtailed during the last two months of the year.

Work to expand the Newcastle plant to a steel capacity of 2.7 million tons per year proceeded on schedule. The expansion included installing the No. 2 bloom and continuous billet mill, uprating the No. 2 merchant mill and expanding the direct metal foundry. At Port Kembla, work on a secondary ore crushing plant, blending facilities, and a third sinter machine continued. The argon-oxygen decarburization plant to improve stainless steel manufacture was completed and preliminary work begun on the installation of continuous slab casting and vacuum degassing facilities. A walking-beam bloom furnace was nearing completion at Whyalla, and work was proceeding on additional oxygen capacity to allow increased oxygen injection into the blast furnace.

Mount Newman Iron Ore Co. produced 28.9 million tons of iron ore in 1974, compared with 26 million tons in 1973. The massive program to increase the capacity at Mount Newman from 30.5 million to 35.6 million tons per year continued, and further expansion was approved. Mining, loading, and transport equipment will be increased at a cost of $85 million to raise production to 40.6 million tons per year by 1976. Shipments during the year totaled 33 million tons.

**Lead and Zinc.**—Australia's lead and zinc industry faced difficult marketing conditions in 1974, and performance in some sectors fell below 1973 levels. A marked downturn in world demand for lead became evident early in 1974 as most world economies were subjected to the full impact of sharply rising oil prices. Reduced demand was accompanied by a decline in the average monthly spot price for lead on the London Metal Exchange, where the price fell in April. Demand for zinc showed signs of easing in mid-1974 after reaching a peak price of $0.96 per pound in May. However, the full effects of any easing in demand were offset to some extent by a need of both producers and consumers to rebuild stocks to acceptable levels. World producers' stocks had fallen to a 9-year low in December 1973.

Mine production of lead fell 7% to 377,300 tons mainly because of lower output by Broken Hill mines which normally accounted for about 62% of total Australian production. Zinc Corp. Ltd. and New Broken Hill Consolidated Ltd. (NBHC), operated by Australian Mining and Smelting Co. Ltd., reported a substantial drop in mine production in the first half of 1974. Lower output resulted mainly from a cave-in at the NBHC mine in 1973, difficulties with some mechanical equipment, and minor industrial problems. Output was also adversely affected by continued delays experienced in commencing new stopes in areas of the NBHC mine adjacent to the caving.

Lead bullion output decreased marginally to 147,200 tons in 1974. Higher output by Mount Isa Mines Ltd., failed to offset decreased production by Sulphide Corp. Pty. Ltd. at Cockle Creek, where the production decline resulted from a furnace maintenance shutdown, industrial problems, and disruption of coke suppliers. Refined lead production increased to 192,800 tons, about 1% over that in 1973.

Total domestic zinc mine production decreased 5% to 453,500 tons in 1974. Although the Zinc Corp. Ltd. and Electrolytic Zinc Co. of Australasia (EZ) recorded gains compared with 1973 output. A number of important developments affecting the Australian zinc industry were reported in 1974. In February Triako Mines N.L. announced that agreement had been reached with BHP concerning its participation in the exploration and development activities being conducted by Triako and its affiliated company, Buka Minerals N.L. Under the arrangement BHP's wholly-owned subsidiary, Dampier Mining Co. Ltd., obtained the right to acquire a majority interest in both Triako and Buka.

The directors of Broken Hill South Ltd. (BH), CRA, and Broken Hill Associated Smelters Pty. Ltd. (BHAS) announced in March that an agreement had been reached to sell BH South's 20% shareholding in BHAS to Australian Mining and Smelting Ltd. for $17.5 million. Since BH South is no longer engaged in lead mining at Broken Hill, the proposed change will more closely reflect the present supply of lead concentrates to BHAS, Australia's sole primary lead refinery. Also in March, EZ announced that mining had commenced at Beltana, South Australia, to meet an export contract for a trial shipment of willemite. Operation on a modest scale is scheduled for a number of years. Reserves at Beltana were estimated at 1 million tons assaying 34.5% zinc and 2.8% lead and 237,000 tons assaying 14.8% zinc and 10.6% lead.

Total ore treated at Mount Isa in 1974 amounted to a record 7.45 million tons, yielding 124,000 tons of lead, 103,000 tons of zinc, and 8.9 million ounces of silver. These production gains over 1973 reflect increased capacity following completion of an expansion program in 1973. Nevertheless, production was restricted early in 1974 due to closure in January of the flood-damaged Mount Isa-to-Townsville railway. Coal could not be sent to Mount Isa, and production was cut by half and then gradually increased as the supply situation returned to normal. Silver-lead-zinc ore reserves decreased by approximately the quantity of ore mined for the year. Ore reserves were estimated at 56 million tons in 1973. The Hilton mine, located about 13 miles from Mount Isa, has ore reserves estimated at 36 million tons. This silver-lead-zinc deposit was developed by Mount Isa Mines Ltd. Two shafts have been sunk, and the company reported that further development work was underway. The mine was expected to become operational in 1980.

EZ operated three mines and a central concentrating plant at Rosebery on the west coast of Tasmania. The Rosebery mine was responsible for more than 90% of the total ore produced in this district. The remainder was supplied by the small Farrell and Hercules mines located near the Rosebery mine. Production at the three mines in 1974 increased 5% to 526,200 tons of ore, yielding 127,000 tons of zinc concentrate and containing 67,000 tons of zinc. Industrial disputes and other problems at concentrate supply sources affected supplies of zinc concentrate to the Risdon smelter and resulted in a reduction in slab zinc production. The situation was partially alleviated late in the year by importing 22,000 tons of zinc concentrate from Canada and increased shipments from the Broken Hill mines. The total production of slab zinc, however, declined to 181,300 tons, 6% below the 1973 level. Construction of the world's largest fluid-bed roaster for zinc concentrate continued throughout the year. The commissioning of the new plant was expected early in 1975.

Australian Mining and Smelting Co. Ltd. operated The Zinc Corp. Ltd. and NBHC mines at Broken Hill. Ore treated in 1974 by The Zinc Corp. was 760,000 tons assaying 10.8% lead, 2.7 troy ounces of silver per ton of ore, and 10.1% zinc. At the NBHC mine, ore treated came to 880,000 tons at grades of 8.7% lead, 2.2 troy ounces of silver and 13.8% zinc. Ore reserves in 1974 were estimated at 6.1 million tons at the Zinc Corp. and 6.5 million tons at NBHC. North Broken Hill Ltd. also operated a mine at Broken Hill, New South Wales. This mine treated 455,296 tons of ore, producing 58,400 tons of lead 314,000 ounces of silver and 46,900 tons of zinc valued at $31.9 million. Ore reserves at June 30, 1974, were 4.6 million tons. Mine output by leading producers for 1972–74 were as follow, in tons:

| Mine | 1972 | | 1973 | | 1974 | |
|---|---|---|---|---|---|---|
| | Lead | Zinc | Lead | Zinc | Lead | Zinc |
| North Broken Hill Ltd | 58,584 | 46,648 | 63,364 | 46,313 | 58,383 | 46,922 |
| The Zinc Corp. Ltd | 86,039 | 78,832 | 82,860 | 60,900 | 74,850 | 62,800 |
| New Broken Hill Consolidated Ltd | 85,010 | 142,101 | 82,140 | 138,100 | 71,150 | 114,200 |
| Mount Isa Mines Ltd | 112,510 | 102,313 | 112,510 | 102,754 | 124,381 | 103,051 |
| Electrolytic Zinc Co. of Australasia Ltd. (Read-Rosebery) | 19,879 | 66,559 | 26,290 | 75,894 | 26,311 | 76,777 |

**Manganese.**—Production of manganese ore decreased marginally in 1974 to 1,521,989 tons. Increased output at the enlarged facilities of Groote Eylandt Mining Co. Pty. Ltd., a subsidiary of BHP, in the Northern Territory did not offset decreased production in Western Australia. Groote Eylandt operated the major open pit manganese mine on an island in the Gulf of Carpentaria. New production facilities included a concentrator, mining equipment, ore handling equipment, and a stockpiling area. Stockpiling facilities were increased fivefold to a 200,000-ton capacity, which included an elevating stacker and bucket-wheel system. Three 90-ton-capacity road trains were introduced to haul ore 10 miles from the concentrator plant to the ship-loading and stockpile areas. Groote Eylandt production totaled a new high of 1.4 million tons, 1.2 million tons for export and 188,612 tons for domestic consumption, in 1974. Previously, most of the ore from this 100-million-ton deposit was shipped to the BHP ferroalloy plant at Bell Bay in Tasmania.

Manganese ore produced in Western Australia totaled 95,000 tons in 1974. A ferruginous manganese deposit in northwest Western Australia with 20 million tons of proven reserves, worked by Longreach Manganese Pty. Ltd., produced about 38,000 tons of ore. Longreach made an agreement with Goldsworthy Mining Ltd. to use its rail and port installations. The Woodie Woodie ore deposit, worked by Bell Bros. Pty. Ltd., produced 56,000 tons of ore and sold 57,000 tons to Japanese consumers. Additionally, 4,741 tons of manganese dioxide was recovered as a sludge in the electrolysis of zinc sulfate at the Risdon plant of EZ. This material was used in fertilizers and chemical processes.

**Nickel.**—World nickel consumption continued to increase at a rapid rate, and during most of 1974 demand exceeded supply. To meet this demand, nickel producers around the world continued to build new facilities and to expand existing facilities. In Australia, production of nickel in concentrates during 1974 was 43,155 tons, 6% above the 1973 level. Several nickel producers arranged sales contracts, and domestic nickel production was expected to expand substantially in the immediate future.

Western Mining Corp. Ltd. (WMC), Australia's principal nickel producer, increased sales by 17% compared with 1974, and nickel production was up 14%. WMC delineated additional nickel deposits in the Kambalda area and began developing new ore shoots. Poseidon Ltd. announced that production would commence from its properties near Rockhamton, Queensland, and BHP planned production by 1977 from its Wingellino mine in Western Australia. The Selection Trust Group announced further increases in ore reserves at the Agnew deposit, also located in Western Australia. The partnership of Poseidon Ltd. and Union Hannah-Homestake was dissolved, and Poseidon began developing leases at Mount Windarra and South Windarra in partnership with WMC.

Substantial progress was made in consolidating and expanding WMC nickel operations in 1974. The company's nickel capacity of about 38,000 tons per year was the fourth largest in the western world in 1974. Nickel recovered in concentrates by WMC from the Kambalda ore increased 14% to 35,490 tons during the year. The Lunnon-Hunt, Durkin, and Otter-Juan mines were the main sources of production. Output from the Fisher mine increased, and production commenced from the Ken and Gellatly shoots. Purchase of ore from the Nepean mine, Great Boulder Mines Ltd., and North Kalgurli Mines Ltd. by WMC resulted in an additional 2,270 tons of nickel. Agreement was reached with Selcast Exploration Ltd. to purchase ore and concentrates produced from its Spargoville Area 3 mine. Deliveries were due to commence early in 1975.

Additional equipment, including an oxygen plant, was installed at the Kalgoorlie nickel smelter in preparation for increasing capacity to approximately 40 tons of nick-

el-in-matte per year. This equipment was tested and proved satisfactory. Work also began on expanding the Kwinana refinery to a capacity of 30,000 tons of nickel per year.

Exploration at Kambalda and in the Paris-St. Ives areas proved additional ore. Two new ore shoots were defined on the eastern flank of the Kambalda Dome. The search for nickel deposits outside the Kambalda-St. Ives regions continued with effort concentrated in the Kalgoorlie District.

The Western Australian Government signed an agreement under which a major nickel mining and treatment operation may be established near Agnew, 350 miles northeast of Perth. The deposit is one of the world's largest undeveloped nickel ore bodies with an estimated 40 million tons of ore averaging more than 2% proven nickel. Plans included development of an opencut mine and construction of a concentrator and a flash smelter. Construction was expected to begin late in 1975 with completion targeted for 1978. The ultimate cost of the project was estimated at $350 million. Initial production was expected to be 25,000 tons of nickel-in-matte which would need further refining. The matte will be shipped by truck and rail to the port of Esperance on the Australian Bright. The operation will be a joint venture of Western Selcast Pty. Ltd. (a subsidiary of the Selection Trust Group) and Mount Isa Mines.

Late in 1974, work on Australia's first laterite nickel mining project was completed. This project, located 140 miles inland from Townsville, Queensland, is owned by Freeport Minerals Co., Australia Co. N.L., and Metals Exploration N.L. All sections of the project were put into operation, and both nickel oxide and nickel-cobalt sulfide production commenced. Throughput was being progressively increased and design capacity was scheduled to be achieved by the third quarter of 1975. Ore reserves were estimated at 44 million tons containing 1.57% nickel and 0.12% cobalt. Sales contracts were signed covering about 95% of the mine output.

Both the Nepean and the Mount Keith mines in Western Australia are also jointly owned by Metals Exploration and Freeport Minerals. Nepean produced 72,000 tons of ore, containing 2,500 tons of nickel in 1974. Drilling of five test sites at Mount Keith increased indicated reserves in excess of 300 million tons at a grade of 0.6% nickel. Further exploratory drilling will be conducted in sites in the Albion Downs Basin. The mine is located north of Kalgoorlie, in Western Australia.

**Silver.**—Virtually all of Australia's silver was a coproduct of lead, zinc, and copper. There were no significant mining operations in Australia based primarily on silver. In 1974, domestic silver production decreased about 3.6% as a result of lower output by The Zinc Corp. Ltd. mine and the NBHC mine located at Broken Hill. The marginal increase in silver output by Mount Isa mines, Australia's largest silver producer, failed to offset the decline at Broken Hill. Queensland produced 53%, New South Wales 34%, and Tasmania 12% of all silver mined in Australia during 1974; Northern Territory and Western Australia supplied the remaining 1%. About 75% of the silver production was obtained from lead-silver bullion from smelting lead concentrates. Copper and zinc concentrates generated 14% and 9% of the silver output, respectively, and other concentrates (primarily gold bullion) provided about 1% of the silver. Principal producers of silver and their output during 1973 and 1974 were as follow in thousand troy ounces:

| Company | Quantity | |
|---|---|---|
| | 1973 | 1974 |
| North Broken Hill Ltd | 3,106 | 3,140 |
| The Zinc Corp. Ltd | 2,305 | 1,936 |
| New Broken Hill Consolidated Ltd. | 1,805 | 1,424 |
| Mount Isa Mines Ltd | 8,768 | 8,896 |
| Electrolytic Zinc Co. of Australasia Ltd | 3,081 | 2,571 |

Total production of refined silver (including silver of secondary origin) increased slightly in 1974. Mint production was down sharply because supplies of silver coinage withdrawn from circulation decreased. About 40% of the 1974 mine production was recovered as primary silver, nearly 45% was contained in lead bullion exported for refining overseas, and the remainder was contained in exported lead, copper, zinc, and copper-gold concentrates, and blister copper. BHAS produced 5.4 million troy ounces of refined silver as a byproduct of lead smelting and refining operations in 1974 and accounted for 80% of the total Australian production. Electrolytic Refining & Smelting Co. of Australia Pty. Ltd. recovered most of the remainder from Mount Lyell and Cobar copper concentrates. Silver was also re-

fined at the Perth Mint, by Matthey Garrett Pty. Ltd. in Sydney, and by Englehard Industries Pty. Ltd. in Melbourne. These operations were based mainly on scrap and bullion.

**Tin.**—Despite the lifting of export controls by the International Tin Council (ITC), production of tin in Australia decline 1% to 9,990 long tons, from 10,105 long tons in 1973. The drop in production occurred during the first 8 months, as output at most mines increased in the last quarter. Domestic consumption increased 9% over last year. The rise reflected the increased demand for tinplate and for tin to be used in float glass applications.

Renison Ltd., Australia's largest tin producer, began operations at its new heavy-media separation plant in late 1974, with an increase in mill throughput from 450,000 to 700,000 long tons per year. Production of tin-in-concentrate improved marginally to about 5,200 long tons. Recovery of tin metal from concentrates was 69.2%. Proved and probable ore reserves at its Tasmania mine were 9.3 million long tons at 1.36% tin. Renison and Consolidated Gold Fields Australia Ltd. continued exploration at Tasmania's Mount Lindsay tin prospect.

Aberfoyle Tin Co. N.L., a company controlled by Cominco Ltd., operated mines at Storeys Creek and Rossarden, near Aberfoyle, Tasmania. In the 48 working weeks of 1974, 42,137 long tons of ore was milled. Indicated ore reserves were 322,000 long tons.

Ardlethan Tin N.L. and Cleveland Tin N.L. both part of the Aberfoyle Group, operated throughout 1974. At Ardlethan, 449,500 long tons of ore was treated. Ore reserves were estimated at 2.5 million long tons with an estimated grade of 0.62%. Cleveland Tin treated some 314,210 long tons of ore in 1974. Ore reserves were estimated at 2.2 million long tons with a grade of 0.82% tin and 0.34% copper.

A tin-tantalite dredging plant was operated in an area about 160 miles south of Perth by Greenbushes Tin N.L. In 1974, 1,394 cubic yards of material was treated. The company negotiated an agreement with Vultan Minerals Ltd. for the purchase of its leases at Greenbushes.

Principal producers of tin concentrate and quantities of contained tin produced in 1973 and 1974 were as follow in long tons:

| Company | 1973 | 1974 |
|---|---|---|
| Aberfoyle Tin Co. N.L | 336 | 420 |
| Ardlethan Tin N.L | 1,520 | 1,495 |
| Cleveland Tin N.L | 1,385 | 1,470 |
| Gibsonvale Alluvials N.L | 415 | 440 |
| Greenbushes Tin N.L | 508 | 695 |
| J.A. Johnson & Sons Pty. Ltd | 65 | 115 |
| Loloma Ltd | 103 | 111 |
| Pilbara Tin Pty. Ltd | 310 | 215 |
| Ravenshoe Tin Dredging Ltd | 445 | 490 |
| Renison Ltd | 4,220 | 3,889 |
| Tableland Tin Dredging N.L | 420 | 418 |

**Titanium Concentrates.**—In 1974, Australia produced slightly over 1 million tons of titanium concentrates, increasing its lead as the world's largest producer.

Producers of rutile on Australia's East Coast in 1974 were Associated Minerals Consolidated Ltd.; Minsales (a subsidiary of Union Corp. Ltd. of South Africa), whose operating subsidiaries were Cudgen R.Z., and Consolidated Rutile Ltd.; Rutile and Zircon Mines (Newcastle) Ltd.; Mineral Deposits Ltd. and Queensland Titanium Mines Pty. Ltd. (both subsidiaries of NL Industries Inc.); and Dillingham Mining Co. In 1974, this group of companies also produced 35,000 tons of ilmenite.

In the Bunbury areas of Western Australia, the largest producer of ilmenite was Western Titanium Ltd., a subsidiary of Consolidated Gold Fields. Other producers were Western Mineral Sands, Pty. Ltd., Cable Sands Pty. Ltd., and Westralian Sands Ltd. In the Geraldton area, companies included Allied Eneabba Pty. Ltd., Jennings Mining Ltd., and Western Mining Corp., which took over the holdings of a number of corporate entities including West Coast Rutile Ltd., Black Sands Ltd., Kamilaroi Mines Ltd., and Mining Corp. of Australia Pty. Ltd. The mines in Western Australia, in addition to ilmenite, produced 3,750 tons of rutile in 1974.

On Fraser Island in Queensland, site preparation began early in 1974 for a sand operation jointly owned by Dillingham Mining Co., and Murphyores Holdings, Ltd. The deposit contains 2% heavy sands, and is expected to produce 65,000 tons of rutile and zircon, in about equal quantities, plus a small ilmenite byproduct. A wet mill will be built on the island, from which rough concentrates will be barged to a dry mill to be built at Maryborough. Environmental restoration will be conducted on a continuous basis. An initial investment of about $6 million was expected, with the operation to come on line

in mid-1975. Sand reserves were estimated to be sufficient to support 15 years of production.

Associated Minerals Consolidated Ltd. was reportedly investigating processes for producing synthetic rutile from its growing stockpiles of otherwise unusable ilmenite.

In Western Australia, Allied Eneabba Pty. Ltd., encouraged by the results of 7 months of pilot plant operation, began building its full-scale plant to produce 50,000 tons of rutile, 200,000 tons of ilmenite, and more than 100,000 tons of zircon per year, together with smaller quantities of other minerals. Rough concentrates will be moved to Geraldton for finishing. The plant was expected to cost $15 million and will be in production by July 1975. The ilmenite will be exported to pigment plants of E.I. du Pont de Nemours & Co., Inc., in the United States; other products will be sold on the open market.

In the same area, the Jennings Mining made its initial shipment of ilmenite from Geraldton to Japan. When in full production, output was expected to reach 240,000 tons per year of heavy minerals.

Late in 1974, WMC exercised its option to buy the entire issued capital stock of Black Sands Ltd., a company holding several mineral sands deposits including one at Jurien Bay. Black Sands was formerly owned two-thirds by Kamilaroi Mines, Ltd., and one-third by Mining Corp. of Australia. The price of the purchase was reportedly $11.5 million. Heavy mineral reserves were about 3.5 million tons. WMC plans to sell rutile and zircon, but to stockpile 200,000 tons of ilmenite per year, probably with the intention of using it subsequently as a raw material for making synthetic rutile. WMC had no immediate plans for the Black Sands Ltd. deposit at Cooljarloo.

Laporte Industries (Holdings) Ltd. began a series of additions to its sulfate-process pigment plant at Bunbury to add 50% to plant capacity by early 1976. Additional ilmenite supplies will be obtained from Western Titanium N.L., which reportedly was considering the large-scale operation of a heretofore unworked deposit in addition to the present activity at Capel.

Westralian Sands Ltd., jointly with Lennard Oil N.L., outlined a 2-million-ton body of sand near Gingin and was planning commercial production.

## NONMETALS

**Phosphate Rock.**—The final decision to commence full-scale development of the Duchess deposit was made by BH South in 1974. Queensland Phosphate Pty. Ltd., a subsidiary of BH South, will operate the mines. Production was scheduled for early 1975. Production will come from the Duchess deposits, which are located about 70 miles southeast of Mount Isa. Reserves at the large Duchess deposit and the smaller Ardmore deposit were estimated at 1.4 billion tons of phosphate rock grading 17.5% $P_2O_5$, and within the two deposits there are 40 million tons of 31% rock. Initial production was expected to be 200 tons per day, but yearly output of 3 million tons was planned by 1977.

BH South reported that substantial progress was made at the mine site. Removal of overburden was near completion. The crushing and screening plant was commissioned, and the access road to Duchess was completed. The rail link to the plant site was due for completion late in 1974, and the necessary support facilities at the mine were ahead of schedule.

Estimated capital expenditures to bring the property to a production rate of 1 million tons per year was put at $59 million. Some $33 million of this sum will be used for rail extension and and rolling stock. Financing was being provided by a consortium of Australian banks.

Imports of phosphate rock totaled 4 million tons, most of which came from Nauru and other Pacific islands, Christmas Island in the Indian Ocean, and, to a lesser extent, from Africa and the United States.

**Salt.**—Australia's production and exports of salt increased about 18% and 6%, respectively, in 1974. All domestic salt was produced by solar evaporation of seawater or natural brines associated with inland lakes. Although domestic demand continued to increase, exports to Japan were the principal outlet. New markets in Asia were developed, but several large Western Australia companies signed medium and long-term contracts with Japanese consumers.

The total 1974 production of Shark Bay Salt Co. was committed to Japan under sales contracts negotiated by Mitsui & Co. Ltd., which took a 49% equity in the project. The participation of Mitsui enabled the construction of a causeway to the

ship-loading point on Topper Island, allowing easier transport to the stockpile. The salt was originally transported to the stockpile by a slurry pipe line, but significant losses led to abandonment of this procedure. The bulk of Texada Mines Pty. Ltd. common salt production continued to be exported to Japan. Texada Mines' first shipment was made in 1967, and by yearend 1974 the company had exported more than 6 million tons of salt from its port complex at Cape Cuvier, Western Australia. Texada Mines is a wholly owned subsidiary of Southern Cross Mines Ltd. of Palo Alto, Calif. It is the largest producer of evaporates in the world and the second largest producer of solar evaporated salt.

South Australia ranked second after Western Australia in salt production. The main producers were Imperial Chemical Industries of Australia and New Zealand Ltd. (ICIANZ), followed by The Broken Hill Pty. Co. Ltd. at Whyalla. Both are seawater-solar evaporation pan operations. Together, they contributed 69% of the State's total production of 640,000 tons in 1974. Other principal salt-producing centers were Stenhouse Bay, Lake Fowler, and Lake MacDonnell.

Salt production in Queensland was down slightly from the 116,000-ton output in 1973. The two production companies are Central Queensland Salt Industries Ltd. and ICIANZ, both at Bajool. In Victoria, Cheetham Salt Ltd. was the main producer with operations based on seawater-solar evaporation pans near Melbourne. Salt is also harvested in smaller quantities from inland saline lakes in both the northwest and western parts of the State.

After a complete revision of harvesting procedures, Lefroy Salt Pty. Ltd. operated at normal capacity and began shipping to Japan. The new procedure necessitated the erection of a washing plant to improve the quality of salt to meet the requirements of the Japanese market.

**Sulfur.**—Imports of elemental sulfur decreased from 420,000 tons in 1973 to below 400,000 tons in 1974. Most of the imported sulfur and virtually all of the sulfur recovered from domestic pyrite and metallic sulfide ores was used in manufacturing sulfuric acid. Reflecting increased requirements by the manufacturers of superphosphate fertilizers, production of sulfuric acid was slightly above the 1973 level. During 1974, three companies produced a combined total of 224,251 tons of pyrite concentrates from base metal operations. These companies were Mount Lyell and Electrolytic Zinc, both in Tasmania, and Mount Morgan, Ltd., in Queensland. Lead and zinc concentrates were the basis of sulfuric acid produced at the smelters at Risdon, Tasmania, and Cockle Creek, New South Wales. In addition, alkylation sludges and hydrogen sulfide from some oil refineries and spent oxide from gas works provided a source of sulfide for acid production.

Sulfuric acid production increased 9% from 2.4 million tons in 1973 to 2.6 million tons in 1974. Of the total production in 1974, around 70% was made from elemental sulfur, 10% from pyrites, 19% from lead and zinc concentrates, and the remaining 1% from other materials. Consumption of sulfuric acid in 1974 was 2.4 million tons, of which 81% was used in the manufacture of superphospate, 2% for ammonium sulfate, and 17% for mining and metallurgical uses.

## MINERAL FUELS

**Coal.**—*Black.*—During 1974, the upward trend in Australia's coal industry was maintained. Moderate increases were recorded for both bituminous coal and lignite, although production during early 1974 was adversely affected by industrial disputes, floods, and wet-weather conditions. Increasing quantities of coal were produced in the Bowen basin area of central Queensland, Australia's major coal basin. The huge basin has known reserves of 13.3 billion tons of steam and coking coal. The coal occurs in seams that are from 2 feet to more than 160 feet thick.

Domestic black coal production increased to 70.4 million tons, 4% higher than that in 1973. Production in New South Wales and Queensland accounted for 95% of the total supply. Output in New South Wales increased 821,000 tons to 38.7 million tons. The major increases were those recorded from opencut mines of the northern district, particularly those supplying the Liddell powerstation, as well as from underground mines of the south coast in the southern district. Production in Queensland increased 1.3 million tons to 28.5 million tons in 1974, as existing operations in the Bowen basin expanded and new mines were developed. The major part

of the increase resulted from opencut operations at Goonyella and Peak Downs.

Exports to Japan and Europe increased in 1974. Japan, Queensland's largest customer, imported 13.1 million tons (up 5%), followed by Italy, 1 million tons (up 56%), and the Netherlands, 561,000 tons (up 20%).

France almost doubled its imports of Queensland coal with a purchase of 232,000 tons, mainly from the Peak Downs mine, 120 miles west of Mackay. This mine increased production 87% in 1974 to 4.4 million tons. Peak Downs is owned by Central Queensland Coal Associates (CQCA), a joint venture between Utah Development Company (85%) and Japanese-owned Mitsubishi Development Company (15%). CQCA expects to duplicate its coal export facilities at the port of Hay Point, south of Mackay, to supply a total capacity of 20 million tons of coal per year from Peak Downs and nearby Goonyella. Both mines are opencut and produce medium-volatile hard-coking coal. Development of the two mines, with township, port, railway, and ancillary services, cost $162 million.

Several other mines (Blackwater, Moura-Kianga, and Blair Athol) of similar size to Peak-Downs-Goonyella also operated in the Bowen basin during 1974. The Blackwater mine was operated by Utah Development Company. This field is 134 miles west of Rockhampton. The opencut mine produced medium-volatile, bituminous coking coal. Measured and indicated reserves were 1.4 billion tons of coking coal and 1 billion tons of noncoking coal. The mine exported 3.6 million tons to Japan.

Moura-Kianga mine, an opencut underground mine 87 miles southwest of Gladstone, was operated by Theiss Peabody Mitsui Coal Pty. Ltd., a consortium owned 22% by Theiss Holdings Ltd, 58% by American-based Peabody Coal Co., and 20% by Japan's Mitsui & Co. Present contracts will supply 4 million tons of hard-coking coal each year to Japanese steel mills.

Blair Athol mine, operated by Blair Athol Coal Pty. Ltd., produced 1.5 million tons of steam coal for local markets. Plans were underway to expand mine production to 6 million tons per year.

The proportion of coal mined by opencut methods in Queensland was around 87% in 1974, as output from Peak Downs increased and the Saraji mine commenced production during the year. In New South Wales, the quantity of coal recovered by underground methods decreased from 90% in 1973 to around 80% in 1974. In South Australia all coal was mined by opencut; in Tasmania by underground; and in Western Australia both methods were used (opencut output comprised about 65% of the total).

The number of miners in the coal industry as of yearend 1974 was 19,171, compared with 13,750 in 1973. Of these, 13,714 were in New South Wales and 4,531 in Queensland. South Australia, Western Australia, and Tasmania together employed less than a thousand miners. Coal output per shift in Australia was among the highest in the world. Production per man-shift worked underground came to 9.25 tons in 1974. In opencut mining the figure was 27.18 tons.

Australia's reserves of black and brown coal are such that at current or increased production rates reserves could last for hundreds of years. Known recoverable reserves of black coal are estimated to be more than 50 billion tons. There are also very large reserves at greater depths and some of these should be ultimately economic to recover. The Joint Board reported that New South Wales reserves of black coal totaled 26 million tons. The Queensland Coal Board reported that its measured and indicated reserves came to 13 billion tons. The Joint Coal Board reported output in leading producing States as follows:

**Table 5.—Production of black coal**
(Thousand metric tons)

| State | 1972 r | 1973 r | 1974 |
|---|---|---|---|
| Queensland | 23,489 | 27,189 | 28,501 |
| New South Wales | 39,176 | 37,882 | 38,703 |
| Tasmania | 132 | 115 | 128 |
| South Australia | 1,602 | 1,510 | 1,671 |
| Western Australia | 1,168 | 1,171 | 1,446 |
| Total | 65,517 | 67,867 | 70,449 |

r Revised.

Domestic consumption of black coal in recent years were as follow in thousand tons:

| | 1971 | 1972 | 1973 |
|---|---|---|---|
| Iron and steel | 7,653 | 8,948 | 9,754 |
| Electricity | 13,874 | 14,607 | 14,875 |
| Railways | 76 | 33 | 42 |
| Town gas | 249 | 131 | 164 |
| Cement | 793 | 899 | 876 |
| Metallurgical coke | 440 | 473 | 542 |
| Other (including bunkers) | 2,404 | 2,303 | 2,482 |
| Total | 25,489 | 27,394 | 28,785 |

*Brown.—(Lignite).*—Production of brown coal increased by 10% over that of 1973 to 27.2 million tons. Victoria was the only State in Australia in which brown coal was produced. Substantial deposits exist in South Australia, but these were regarded as subeconomic under current conditions. The major deposits in Victoria were in the Latrobe Valley, 60 miles southeast of Melbourne, where operations of the State Electricity Commission at Yallourn and Morwell were responsible for more than 90% of the total State production. Smaller quantities were produced from privately owned mines at Bacchus Marsch and Anglesea.

The State Electricity Commission of Victoria produced 26.1 millions tons of raw brown coal in 1974 compared with 23.4 million tons in 1973. Of the 1974 total, 11.2 million tons was obtained from the Yallourn opencut, 280,000 from the Yallourn North extension opencut, and 14.6 million tons from the Morwell opencut.

Alcoa of Australia Pty. Ltd. operated an opencut mine at Anglesea, 40 miles southwest of Melbourne, to provide fuel for its powerstation. Most of the electricity required by the Point Henry aluminum smelter was supplied from this powerstation. At Bacchus Marsch, brown coal was produced by Maddingley Brown Coal Co.

Because brown coal deteriorates rapidly and cannot be economically transported, virtually the entire mine production was consumed locally. The use pattern in recent years has approximated 80% in generation of electric power, 15% in manufacture of briquets, and 5% as an industrial fuel.

**Petroleum and Natural Gas.**—The upward trend of the past decade in the Australian petroleum industry was reversed in 1974, natural gas production, however, continued to increase. The 141-million-barrel petroleum output in 1974 was slightly lower than the 142 million barrels produced in 1973. The decrease resulted mainly from a drop in production at both the Barrow Island Moonie Fields, as production from the Gippsland Basin Fields increased sharply. Australia produced approximately 70% of its domestic crude oil requirements, from which about 90% of the Nation's supply of gasoline, diesel distillate, aviation turbine kerosine, and heating oil was produced. Usage of natural gas (including field and plant usage) during 1974 totaled 155,486 million cubic feet, a 7% increase over that of 1973.

In 1974, BHP and Esso Exploration & Production Australia Inc. produced 131,373,000 barrels of crude oil from the Gippsland Basin Field, equivalent to about 60% of Australia's consumption. Because of industrial disputes in the refining and shipping industries, production was about 7.5 million barrels less than expected. BHP-Esso also produced 1,104,000 tons of liquefied petroleum gas during the year, and natural gas deliveries totaled 15,670,000 cubic feet. Ethane production was 50,300 tons.

Installation of a booster pump station on the Halibut platform and a solution gas compressor on the Kingfish B platform have raised production capacity of the Halibut-Kingfish crude oil system to about 385,000 barrels per day. With the addition of Barracouta crude oil, and gasfield condensate, a peak per day production capacity of about 395,000 barrels can be attained. As a result of continuing seismic work, the recoverable reserves of the Halibut Field were 640 million barrels.

The Barrow Island Field in Western Australia was Australia's second largest oil-producing area. The number of wells producing crude oil at yearend 1974 was 321. The production rate averaged approximately 38,000 barrels per day. The 1974 oil output per day in the other producing States were as follow: Queensland 85 barrels and Victoria 2,700 barrels.

Despite a slight decline in production in 1974, total consumption of petroleum products increased 9% over that of 1973 to the highest level since 1969. The increase was attributed to the large rises in consumption of industrial diesel fuel, aviation turbine fuel, heating oil, lighting kerosine, and lubricants. Gasoline was the largest single item of petroleum products consumed in Australia; sales during the year were 77 million barrels, of 8.4% over the 1973 total.

Australia's 12 refineries produced 207 million barrels of marketable products in 1974, an increase of nearly 1% above the 1973 levels. Foreign trade in these items included exports totaling 26 million barrels, more than twice that for 1973. The largest volume increase was in exports of automotive gasoline, which almost doubled the 1973 quantity. Decreases were recorded only for power kerosine, fuel oil, and lubricants. Japan remained Australia's main

export market for petroleum products, due largely to its imports of liquefied petroleum gas. New Zealand was the other market. Imports increased by 10.3% in 1974 over those of 1973. Persian Gulf countries (mainly Kuwait and Saudi Arabia) continued to be the major source of imports of crude oil and other refinery feedstock, contributing 98% of the 1974 total.

Exploration in 1974 was conducted in all States and the Northern Territory. These activities culminated in new discoveries near the Marlin Field, Victoria (gas and oil); at the Alton Field, Queensland (gas); near Kalumburu Mission, Western Australia (oil); at Bonaparte Gulf Basin, Western Australia (gas); and at Barrow Island, Western Australia (gas). Total footage drilled for petroleum exploration in 1974 was 591,000 feet, approximately 3% above the 1973 figure. Areas of principal drilling activity were Western Australia—197,700 feet; Queensland—140,900 feet; and Victoria—76,100 feet. About 60% of the footage drilled was offshore, mainly because of the extensive drilling operations in the Northwest Shelf area in Western Australia. Private companies, the Bureau of Mineral Resources, and State geological agencies participated in these programs. Expenditure on petroleum exploration and development in 1974 totaled $14.6 million.

Australian proved and probable reserves of crude oil at yearend 1974 were 3.8 billion barrels. Natural gas reserves were 27 trillion cubic feet.

# The Mineral Industry of Austria

By Grace N. Broderick [1]

The Austrian economy in 1974 continued its strong performance with its gross national product (GNP) showing an increase of about 5% over that of 1973. As in previous years, the mineral industry represented only a small part of the GNP. Aluminum, antimony, copper, lead and zinc, iron and steel, cement, clays, graphite, magnesite, crude oil, and natural gas remained the principal mineral commodities produced in the country.

[1] Physical scientist, Division of Ferrous Metals.

Table 1.—Austria: Production of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Alumina (abrasive grade), gross weight | 26,257 | 28,223 | NA |
| Metal: | | | |
| Primary | [r] 83,989 | 89,131 | 91,554 |
| Secondary | [r] 43,227 | 26,389 | 30,390 |
| Antimony, mine output, metal content | [r] 535 | 577 | 540 |
| Cadmium metal | 26 | 29 | 26 |
| Copper: | | | |
| Mine output, metal content of ore | 2,303 | 2,742 | 2,687 |
| Metal: | | | |
| Smelter | 1,300 | 300 | [e] 300 |
| Refined, including secondary | 22,693 | 22,875 | 26,713 |
| Germanium, metal content of concentrates ____ kilograms | 5,000 | [1] 5,000 | 4,282 |
| Iron and steel: | | | |
| Iron ore and concentrate, gross weight _ thousand tons | 4,132 | 4,211 | 4,245 |
| Pig iron ____ do ____ | 2,846 | 3,006 | 3,443 |
| Ferroalloys (electric furnace) ____ do ____ | [r] 6 | 6 | 6 |
| Crude steel ____ do ____ | 4,070 | 4,238 | 4,699 |
| Semimanufactures ____ do ____ | [r] 3,088 | 3,198 | 3,538 |
| Lead: | | | |
| Mine output, metal content of ore | 6,668 | 6,139 | 5,785 |
| Metal, smelter output: | | | |
| Primary | 9,777 | 9,913 | 8,804 |
| Secondary | 6,505 | 5,472 | 6,808 |
| Manganese, Mn content of domestic iron ore | 80,198 | 81,009 | 80,430 |
| Silver metal including secondary ____ troy ounces | 191,940 | 192,261 | -- |
| Zinc: | | | |
| Mine output, metal content of ore | 20,480 | 22,151 | 20,977 |
| Metal, refined | 16,877 | 16,999 | 16,450 |
| **NONMETALS** | | | |
| Barite | 202 | 428 | 361 |
| Cement, hydraulic ____ thousand tons | [r] 6,345 | 6,260 | 6,425 |
| Clays: | | | |
| Illite | 291,538 | 327,168 | 387,758 |
| Kaolin: | | | |
| Crude | 329,336 | 300,742 | 312,425 |
| Marketable | 89,919 | 82,923 | [e] 83,000 |
| Other [2] | [r] 82,663 | 58,244 | [e] 82,000 |
| Diatomite | 2,453 | 2,135 | 1,986 |
| Feldspar, crude | 3,076 | 2,050 | -- |
| Graphite, crude | 18,772 | 17,211 | 29,550 |
| Gypsum and anhydrite, crude ____ thousand tons | 760 | 871 | 804 |
| Lime ____ do ____ | 798 | 962 | 1,039 |

See footnotes at end of table.

## Table 1.—Austria: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Magnesite: | | | |
| Crude thousand tons | 1,429 | 1,419 | 1,449 |
| Sintered or dead burned do | 451 | 485 | 547 |
| Caustic calcined do | 180 | 180 | 157 |
| Pigments, mineral, iron mica | 8,194 | 9,796 | 9,546 |
| Pumice (trass) | 28,518 | 24,631 | 18,207 |
| Salt: | | | |
| Rock thousand tons | 1 | 1 | (3) |
| In brine: | | | |
| Evaporated do | 256 | 292 | 294 |
| Other do | 241 | 246 | e 239 |
| Total do | 498 | 539 | e 533 |
| Sand and gravel: | | | |
| Quartz sand do | 822 | 963 | e 908 |
| Industrial sand do | 334 | 246 | NA |
| Other sand and gravel do | 6,821 | 6,214 | 9,560 |
| Stone: [4] | | | |
| Dimension stone do | 94 | 104 | NA |
| Quartz and quartzite do | 103 | 113 | 100 |
| Other quarry stone and broken stone do | 1,703 | 1,683 | NA |
| Sulfur: | | | |
| Byproduct: | | | |
| From metallurgy do | 12 | e 15 | e 16 |
| From unspecified sources do | 6 | e 6 | e 7 |
| From spent oxide do | 1 | e 1 | e 1 |
| From gypsum and anhydrite do | 19 | e 20 | e 26 |
| Total do | r 38 | 42 | 50 |
| Talc and soapstone | 83,212 | 92,205 | 98,440 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal, brown coal and lignite thousand tons | 3,756 | 3,634 | 3,629 |
| Coke: | | | |
| Breeze do | 411 | 439 | 1,733 |
| Metallurgical do | 1,255 | 1,280 | |
| Total do | 1,666 | 1,719 | 1,733 |
| Gas, manufactured, all types [5] million cubic feet | 77,763 | 326,589 | NA |
| Gas, natural: | | | |
| Gross production do | 69,327 | 80,163 | 77,930 |
| Marketed production do | 65,459 | 77,335 | e 75,000 |
| Natural gas liquids, condensate thousand 42-gallon barrels | 150 | 214 | NA |
| Oil shale | 380 | 500 | 1,470 |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 17,281 | 17,982 | 15,609 |
| Refinery products: | | | |
| Gasoline do | 12,225 | 13,425 | 13,368 |
| Jet fuel do | 905 | 883 | 736 |
| Kerosine do | 60 | 77 | 60 |
| Distillate fuel oil do | 15,044 | 17,642 | 16,205 |
| Residual fuel oil do | 22,911 | 25,346 | 24,096 |
| Lubricants do | 1,818 | 1,968 | 1,782 |
| Liquefied petroleum gas do | 1,200 | 1,185 | 1,100 |
| Bitumen do | 1,959 | 1,657 | 2,293 |
| Other do | 3,438 | 3,743 | 2,926 |
| Refinery fuel and losses do | 1,419 | 1,653 | 2,496 |
| Total do | 61,009 | 67,579 | 65,062 |

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Germanic acid.

[2] Excludes clay sand.

[3] Less than ½ unit.

[4] Excludes stone used by the cement and iron and steel industries.

[5] Includes blast furnace and coke oven gas. Manufactured gas is reported in source as gas having a calorific value of 4,200 calories per cubic meter. (One cubic meter equals 35.3145 cubic feet.)

## Table 2.—Austria: Exports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Oxide and hydroxide (includes manufactured corundum) | 22,734 | 22,136 | West Germany 4,471; Poland 4,066; Italy 3,006. |
| Metal, including alloys: | | | |
| Scrap | r 31,955 | 37,018 | West Germany 20,871; Italy 11,652. |
| Unwrought | 27,086 | 19,509 | West Germany 8,624; Italy 3,806; Yugoslavia 1,364. |
| Semimanufactures | 34,384 | 42,663 | Yugoslavia 5,391; United Kingdom 3,273; France 3,106. |
| Antimony ore and concentrate | 357 | 450 | NA. |
| Cadmium metal, including alloys, all forms ---- kilograms | 3,500 | 6,000 | All to United Kingdom. |
| Chromium: | | | |
| Chromite | 580 | 30 | NA. |
| Oxide ---- kilograms | 100 | 3,000 | West Germany 2,500. |
| Columbium and tantalum, tantalum metal, including alloys, all forms do | 11,500 | 9,800 | NA. |
| Copper: | | | |
| Ore and concentrate | 4,850 | 5,755 | Czechoslovakia 5,754. |
| Copper sulfate | 1,423 | 917 | Czechoslovakia 777; Italy 140. |
| Metal, including alloys, all forms: | | | |
| Scrap | 373 | 803 | West Germany 658; Italy 126. |
| Unwrought | 6,338 | 10,009 | West Germany 7,654; Switzerland 1,698; Italy 465. |
| Semimanufactures | 12,226 | 10,443 | United Kingdom 2,088; Sweden 1,436; Switzerland 1,224. |
| Gold metal, unworked or partly worked troy ounces | 23,374 | 15,239 | West Germany 11,639; Italy 2,508. |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite | 640 | 950 | All to Belgium. |
| Metal: | | | |
| Scrap | 12,883 | 7,008 | Switzerland 4,070; Italy 2,397. |
| Pig iron, ferroalloys, and similar materials - thousand tons | 6 | 27 | Italy 20. |
| Steel: | | | |
| Primary forms --- do | 331 | 286 | West Germany 241; Italy 13; United Kingdom 12. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, and sections do | 200 | 203 | Italy 39; West Germany 37; Switzerland 27. |
| Universals, plates and sheets ---- do | 617 | 597 | West Germany 174; U.S.S.R. 108; Italy 105. |
| Hoop and strip do | 107 | 92 | Switzerland 23; West Germany 14; Italy 12. |
| Rails and accessories do | 58 | 57 | Switzerland 31; Romania 9; Bulgaria 6. |
| Wire ---- do | 52 | 54 | Switzerland 19; Hungary 7; Italy 5. |
| Tubes, pipes and fittings ---- do | 113 | 149 | Switzerland 36; Sweden 29; West Germany 27. |
| Castings and forgings, rough ---- do | 6 | 7 | Switzerland 2; West Germany 1; Czechoslovakia 1. |
| Lead: | | | |
| Oxide | 1,351 | 1,587 | Czechoslovakia 909; Yugoslavia 278; Hungary 250. |
| Metal, including alloys all forms | 682 | 321 | West Germany 140; Yugoslavia 125. |
| Magnesium metal, including alloys, all forms | 1,834 | 780 | West Germany 686; Italy 79. |
| Manganese: | | | |
| Ore and concentrate | -- | 5 | NA. |
| Oxide | 246 | 385 | Brazil 317; West Germany 40. |
| Mercury ---- 76-pound flasks | 363 | 339 | West Germany 191; France 52; Switzerland 29. |
| Molybdenum metal, including alloys, all forms | 491 | 591 | NA. |

See footnotes at end of table.

## Table 2.—Austria: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Nickel metal, including alloys, all forms | r 588 | 503 | West Germany 251; Yugoslavia 55; Iran 28. |
| Platinum-group metals and silver metal, including alloys all forms: | | | |
| Platinum group ---- troy ounces | 11,896 | 17,651 | West Germany 10,095; Romania 3,183; Bulgaria 2,347. |
| Silver: | | | |
| Bullion - thousand troy ounces | 164 | 325 | All to West Germany. |
| Other (powder) ------- do ---- | 16 | 26 | Do. |
| Semimanufactures ----- do ---- | 103 | 151 | Yugoslavia 100; Switzerland 29; West Germany 10. |
| Tin: | | | |
| Oxide ---------- long tons | r 45 | 6 | Portugal 4; Switzerland 2. |
| Metal, including alloys, all forms do ---- | r 15 | 23 | West Germany 16; Yugoslavia 6. |
| Titanium oxide | (1) | 128 | Yugoslavia 85; Switzerland 21; West Germany 21. |
| Tungsten: | | | |
| Ore and concentrate | 9 | 80 | All to West Germany. |
| Metal, including alloys, all forms | 96 | 157 | NA. |
| Zinc: | | | |
| Ore and concentrate | -- | 3,170 | Italy 2,315; Yugoslavia 855. |
| Oxide | (1) | 101 | Romania 60; Netherlands 40. |
| Metal, including alloys, all forms | 1,045 | 1,423 | West Germany 1,147; Yugoslavia 143. |
| Other: | | | |
| Ore and concentrate | 51 | 86 | NA. |
| Ash and residue containing nonferrous metals | 34,386 | 40,079 | Italy 25,523; West Germany 11,627; Netherlands 1,012. |
| Waste and sweepings of precious metals ---------- kilograms | r 9,142 | 30,247 | West Germany 30,032. |
| Oxides, hydroxides and peroxides of metals, n.e.s | 329 | 169 | Sweden 102; Republic of South Africa 46. |
| Base metals, including alloys, all forms, n.e.s | 50 | 1,697 | United States 824; United Kingdom 673; Italy 142. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum and other natural abrasives | 3 | 8 | NA. |
| Grinding and polishing wheels and stones | 8,419 | 9,853 | West Germany 1,202; Italy 1,049; Romania 896. |
| Asbestos | 136 | 54 | West Germany 42. |
| Barite and witherite | -- | 5 | NA. |
| Cement | 202,059 | 223,149 | Hungary 86,802; Poland 59,660; Yugoslavia 53,161. |
| Chalk | 2,441 | 2,510 | Hungary 926; Italy 728; Switzerland 462. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays: | | | |
| Kaolin (china clay) | 16,501 | 17,615 | Italy 10,254; Poland 2,811; Switzerland 2,696. |
| Other | 364 | 667 | Belgium 257; Czechoslovakia 84; Mexico 49. |
| Products: | | | |
| Refractory (including nonclay bricks) | 225,746 | 247,457 | France 47,725; West Germany 46,082; Belgium 18,008. |
| Nonrefractory | 8,374 | 4,834 | West Germany 4,292; Switzerland 285; Yugoslavia 164. |
| Cryolite and chiolite, natural | -- | 5 | NA. |
| Diamond, industrial - thousand carats | 10 | -- | |
| Diatomite and other infusorial earth | 152 | 455 | Yugoslavia 355; Poland 30. |
| Feldspar | 1,126 | 31 | NA. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Phosphatic | 5,900 | -- | |
| Other | 32 | (1) | NA. |
| Manufactured, phosphatic | 94,418 | 150,260 | Hungary 149,422; West Germany 589; Italy 249. |
| Fluorspar | -- | 212 | All to Yugoslavia. |
| Graphite, natural | 18,791 | 15,004 | Poland 5,372; West Germany 4,549; Italy 1,677. |

See footnotes at end of table.

## Table 2.—Austria: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Gypsum and plasters | 172,122 | 166,734 | West Germany 137,427; Switzerland 29,232. |
| Lime | 5,786 | 15,815 | Hungary 8,001; West Germany 3,322; Yugoslavia 3,066. |
| Magnesite | 166,000 | 158,183 | West Germany 41,294; France 13,276; Italy 5,886. |
| Mica, all forms | 11 | 38 | Yugoslavia 7; Hungary 7; Poland 6. |
| Pigments, mineral, including processed iron oxides | r 5,580 | 6,573 | United Kingdom 1,686; West Germany 1,590; Netherlands 593. |
| Precious and semiprecious stone, including diamond: | | | |
| Natural kilograms | r 470 | 867 | NA. |
| Manufactured do | 1,424 | 2,229 | NA. |
| Pyrite do | -- | 100 | NA. |
| Salt | 2 | 1 | NA. |
| Stone sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous, including marble and limestone | 89,738 | 80,800 | West Germany 72,728; Switzerland 7,896. |
| Slate | 65 | 24 | NA. |
| Other | 42,011 | 42,037 | West Germany 39,307; Yugoslavia 2,487. |
| Worked: | | | |
| Paving and flagstone | 13,872 | 8,174 | Switzerland 6,187; West Germany 1,914. |
| Slate | -- | 6 | NA. |
| Other | 1,850 | 1,710 | West Germany 695; United States 428; Switzerland 374. |
| Dolomite | 7,235 | 4,135 | West Germany 1,275; Philippines 880; Singapore 390. |
| Gravel and crushed rock | 848,513 | 902,769 | Switzerland 758,348; West Germany 124,905; Yugoslavia 16,715. |
| Limestone | 390 | 2,356 | NA. |
| Quartz and quartzite | 280 | 387 | Yugoslavia 163; Czechoslovakia 130; Hungary 54. |
| Sand excluding metal bearing | 175,276 | 132,373 | Switzerland 76,371; West Germany 43,517; Italy 8,712. |
| Sulfuric acid and oleum | 15 | 20 | NA. |
| Talc, steatite, soapstone and pyrophyllite | 70,920 | 76,083 | West Germany 34,162; Italy 13,098; Switzerland 8,575. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 4,485 | 6,146 | West Germany 5,506; Yugoslavia 285; France 244. |
| Slag, dross and similar waste, not metal bearing | 39,564 | 44,407 | West Germany 30,409; Italy 10,192; Czechoslovakia 3,783. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural kilograms | 400 | 200 | NA. |
| Carbon black and gas carbon | 3 | 10 | NA. |
| Coal: | | | |
| Anthracite and bituminous, including briquets | 3 | 43 | NA. |
| Lignite and lignite briquets | 5,168 | 3,562 | All to West Germany. |
| Coke and semicoke | 90,463 | 95,999 | Romania 79,935; West Germany 14,138; Yugoslavia 1,900. |
| Gas, manufactured thousand tons | 25 | 26 | Mainly to Czechoslovakia. |
| Hydrogen, helium and rare gases thousand cubic feet | 4,240 | 8,678 | West Germany 4,873; Hungary 2,152; Bulgaria 1,621. |
| Peat, including peat briquets and litter | 265 | 4 | NA. |
| Petroleum refinery products: | | | |
| Gasoline, aviation and motor thousand 42-gallon barrels | 1 | (1) | NA. |
| Kerosine and jet fuel do | (1) | (1) | NA. |
| Distillate fuel oil do | 18 | 10 | West Germany 7; Czechoslovakia 1. |
| Residual fuel oil do | (1) | 67 | Mainly to Czechoslovakia. |
| Lubricants do | r 980 | 916 | Poland 443; Czechoslovakia 303; Yugoslavia 19. |
| Other do | r 76 | 53 | Yugoslavia 24; Poland 7; Czechoslovakia 7. |
| Total do | r 1,075 | 1,046 | |
| Mineral tar and other coal-, petroleum-, or gas-derived chemicals | 30,554 | 31,178 | Hungary 11,111; Czechoslovakia 9,207; West Germany 6,609. |

r Revised. NA Not available.
1 Less than ½ unit.

## Table 3.—Austria: Imports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite | 30,687 | 28,096 | NA. |
| Oxide and hydroxide | 187,321 | 206,314 | West Germany 10,363; France 2,660; United Kingdom 1,117 (189,961 unreported). |
| Metal including alloys: | | | |
| Unwrought including scrap | 51,172 | 48,869 | U.S.S.R. 24,459; Hungary 7,336; Norway 4,747. |
| Semimanufactures | 16,558 | 21,827 | West Germany 9,002; Switzerland 5,504; Norway 1,604. |
| Antimony: | | | |
| Ore and concentrate | 37 | 138 | Republic of South Africa 57; United States 50; Bolivia 29. |
| Metal including alloys, all forms | 144 | 139 | Yugoslavia 34; Turkey 26; People's Republic of China 25. |
| Arsenic trioxide, pentoxide, and acids | 74 | 55 | West Germany 35; France 20. |
| Cadmium metal including alloys, all forms | 6 | 6 | Mainly from West Germany. |
| Chromium: | | | |
| Chromite | 60,384 | 80,000 | Republic of South Africa 24,452; Cyprus 11,903; Iran 11,486. |
| Oxide and hydroxide | 303 | 383 | West Germany 182; U.S.S.R. 121; People's Republic of China 41. |
| Cobalt oxide and hydroxide kilograms | 2,000 | 1,800 | Belgium-Luxembourg 1,000. |
| Columbium and tantalum, tantalum metal including alloys, all forms do | 17,700 | 12,900 | West Germany 10,000; United States 2,800. |
| Copper: | | | |
| Ore and concentrate | -- | 8 | Belgium-Luxembourg 4. |
| Copper sulfate | 81 | 103 | Switzerland 66; West Germany 31. |
| Metal including alloys: | | | |
| Scrap | 7,878 | 11,880 | West Germany 6,864; Switzerland 3,543; Italy 681. |
| Unwrought | 39,451 | 32,356 | West Germany 13,518; Zambia 5,955; Republic of South Africa 4,149. |
| Semimanufactures | 6,637 | 12,739 | United Kingdom 4,164; West Germany 4,033; Sweden 2,015. |
| Gold metal, unworked and partly worked thousand troy ounces | 1,096 | 386 | Switzerland 264; West Germany 118. |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite thousand tons | 1,504 | 1,970 | Brazil 1,408; U.S.S.R. 415; Sweden 62. |
| Roasted pyrite do | 176 | 141 | Italy 104; West Germany 23; Czechoslovakia 9. |
| Metal: | | | |
| Scrap do | 52 | 100 | Poland 43; West Germany 15; U.S.S.R. 14. |
| Pig iron, including cast iron and similar materials [1] do | 92 | 123 | Hungary 56; U.S.S.R. 45; West Germany 11. |
| Ferroalloys: | | | |
| Ferromanganese do | 20 | 22 | Norway 14; West Germany 2; Republic of South Africa 1. |
| Other do | 48 | 56 | Yugoslavia 7; U.S.S.R. 6; Republic of South Africa 6; Czechoslovakia 5. |
| Steel: | | | |
| Primary forms do | 75 | 128 | Hungary 87; Czechoslovakia 12; West Germany 12. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, and sections do | 91 | 119 | West Germany 68; Hungary 20; Czechoslovakia 9. |
| Universals, plates, and sheets do | 101 | 158 | West Germany 91; Belgium-Luxembourg 17; France 17. |
| Hoop and strip do | 19 | 27 | West Germany 14; Switzerland 6; United Kingdom 2. |
| Rails and accessories do | 4 | 3 | Mainly from West Germany. |
| Wire do | 11 | 12 | West Germany 5; Belgium-Luxembourg 3; Sweden 2. |

See footnotes at end of table.

## Table 3.—Austria: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Metal—Continued | | | |
| Steel—Continued | | | |
| Semimanufactures—Continued | | | |
| Tubes, pipes, and fittings thousand tons | 163 | 213 | West Germany 94; Italy 68; Switzerland 12. |
| Castings and forgings, rough ____ do ____ | 9 | 10 | West Germany 7; Belgium-Luxembourg 1; Italy 1. |
| Lead: | | | |
| Ore and concentrate | 7,145 | 6,391 | All from Italy. |
| Oxide | 101 | 148 | West Germany 96; United Kingdom 40. |
| Metal including alloys: | | | |
| Unwrought, including scrap | 15,983 | 16,115 | Yugoslavia 8,725; Bulgaria 2,003; West Germany 1,229. |
| Semimanufactures | 419 | 188 | West Germany 121; Yugoslavia 41; Portugal 24. |
| Magnesium metal including alloys, all forms | 3,694 | 4,924 | Poland 2,378; Czechoslovakia 1,281; Norway 991. |
| Manganese: | | | |
| Ore and concentrate | 707 | 742 | Morocco 240; West Germany 221; Netherlands 206. |
| Oxide | 328 | 286 | West Germany 159; Belgium-Luxembourg 70; Japan 25. |
| Mercury ____ 76-pound flasks | 513 | 525 | West Germany 165; Netherlands 148; United States 104. |
| Molybdenum: | | | |
| Oxide | 891 | 675 | NA. |
| Metal including alloys, all forms | 10 | 11 | West Germany 6. |
| Nickel: | | | |
| Matte, speiss, and similar materials | 949 | 1,603 | Netherlands 922; United Kingdom 227; Canada 138. |
| Metal including alloys: | | | |
| Unwrought, including scrap | 2,623 | 2,077 | Australia 496; United Kingdom 417; Netherlands 356. |
| Semimanufactures | 839 | 1,161 | West Germany 587; United Kingdom 295. |
| Platinum-group metals and silver metal including alloys, all forms: | | | |
| Platinum group ____ troy ounces | 51,313 | 24,852 | West Germany 16,943; U.S.S.R. 5,112; United Kingdom 1,447. |
| Silver: | | | |
| Bullion thousand troy ounces | 4,344 | 7,170 | United Kingdom 3,884; Poland 820; West Germany 685. |
| Other (powder) ____ do ____ | 48 | 64 | All from West Germany. |
| Semimanufactures ____ do ____ | 958 | 1,048 | West Germany 849; Switzerland 158. |
| Tin metal including alloys, all forms long tons | r 590 | 658 | People's Republic of China 211; West Germany 108; Netherlands 79. |
| Titanium oxide | 8,900 | 10,314 | West Germany 5,749; Finland 1,209; United Kingdom 1,117. |
| Tungsten: | | | |
| Ore and concentrate | 2,643 | 2,254 | NA. |
| Oxide and hydroxide | 194 | 399 | NA. |
| Metal including alloys, all forms | 36 | 41 | United States 23; West Germany 17. |
| Zinc: | | | |
| Ore and concentrate | 674 | 330 | Yugoslavia 325. |
| Oxide | 758 | 708 | West Germany 555; Belgium-Luxembourg 56; United Kingdom 40. |
| Metal including alloys: | | | |
| Scrap and blue powder | 930 | 1,796 | North Korea 920; Hungary 377; West Germany 172. |
| Unwrought | 4,761 | 7,275 | Poland 2,590; West Germany 2,451; Bulgaria 680. |
| Semimanufactures | 851 | 1,297 | West Germany 936; Poland 105; Yugoslavia 94. |
| Other: | | | |
| Ore and concentrate | 8,280 | 9,985 | United States 3,950; Australia 2,200; Netherlands 984. |
| Ash and residue containing nonferrous metals | 45,140 | 49,726 | U.S.S.R. 16,241; East Germany 14,315; Hungary 6,044. |
| Waste and sweepings of precious metals ____ kilograms | 1,193 | 1,010 | Yugoslavia 1,000. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | r 3,202 | 1,889 | Republic of South Africa 737; United States 731; West Germany 178. |

See footnotes at end of table.

## Table 3.—Austria: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Other—Continued | | | |
| Base metals including alloys, all forms, n.e.s | 853 | 4,150 | U.S.S.R. 3,352; Belgium-Luxembourg 241; France 211. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum and other natural abrasives | 722 | 985 | West Germany 569; Italy 222; Netherlands 78. |
| Dust and powder of precious and semiprecious stones (including diamond) kilograms | 19 | 53 | Switzerland 26; United States 18; West Germany 7. |
| Grinding and polishing wheels and stones | 624 | 784 | West Germany 335; Italy 196; Belgium-Luxembourg 59. |
| Asbestos | 39,991 | 39,592 | Canada 20,281; Republic of South Africa 7,125; U.S.S.R. 6,835. |
| Barite and witherite | 4,914 | 4,160 | West Germany 2,727; Czechoslovakia 875; Italy 503. |
| Boron materials: | | | |
| Crude natural borates | 12,606 | 10,951 | United States 8,981; Turkey 1,930. |
| Oxide and acid | 1,039 | 1,169 | France 534; Turkey 420; United States 177. |
| Cement | 112,783 | 94,187 | West Germany 58,540; Italy 18,773; France 6,286. |
| Chalk | 7,806 | 8,932 | France 7,999; West Germany 587; East Germany 260. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 602 | 774 | West Germany 410; United States 273. |
| Kaolin (china clay) | 70,478 | 82,516 | West Germany 25,412; United Kingdom 25,171; Czechoslovakia 23,886. |
| Other | 95,996 | 93,657 | West Germany 50,925; Czechoslovakia 30,705; Poland 5,202. |
| Products: | | | |
| Refractory (including nonclay bricks) | 15,615 | 13,208 | West Germany 7,783; Czechoslovakia 2,275; Yugoslavia 1,040. |
| Nonrefractory | 235,612 | 238,790 | Italy 142,924; West Germany 68,670; Switzerland 10,150. |
| Cryolite and chiolite, natural | 345 | 360 | Mainly from Denmark. |
| Diamond, industrial value | $26,866 | $53,013 | Republic of South Africa $14,454; Belgium-Luxembourg $10,368; West Germany $10,010. |
| Diatomite and other infusorial earth | 3,761 | 4,099 | Hungary 1,651; United States 976; Denmark 560. |
| Feldspar | 9,577 | 9,506 | Sweden 3,701; West Germany 2,973; Italy 2,708. |
| Fertilizer: | | | |
| Crude: | | | |
| Phosphatic | 471,077 | 421,227 | United States 157,467; U.S.S.R. 123,968; Israel 79,875. |
| Potassic | r 55,289 | 31,010 | East Germany 20,510; West Germany 10,500. |
| Other | 2,199 | 1,820 | West Germany 1,229; Switzerland 590. |
| Manufactured: | | | |
| Nitrogenous | r 12,549 | 14,647 | Czechoslovakia 7,020; Poland 3,478; West Germany 3,326. |
| Phosphatic | 290,728 | 134,723 | France 67,674; Belgium-Luxembourg 49,602; West Germany 15,850. |
| Potassic | 346,865 | 264,996 | NA. |
| Other, including mixed | 2,726 | 8,041 | Poland 4,032; West Germany 3,477; East Germany 150. |
| Fluorspar | 13,367 | 17,305 | East Germany 7,191; West Germany 4,527; France 3,245. |
| Graphite, natural | 890 | 274 | West Germany 248; People's Republic of China 25. |
| Gypsum and plasters | 38,586 | 31,439 | West Germany 9,841; Poland 8,721; Switzerland 6,398. |
| Lime | 1,031 | 733 | West Germany 713. |
| Magnesite | 81,373 | 94,877 | Turkey 58,978; Greece 22,193; Italy 7,941. |
| Mica: | | | |
| Crude, including splittings and waste | 398 | 444 | Norway 168; West Germany 114. |

See footnotes at end of table.

## Table 3.—Austria: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Mica—Continued | | | |
| Worked, including agglomerated splittings | 49 | 68 | Switzerland 33; West Germany 15; Belgium-Luxembourg 10. |
| Pigments, mineral: | | | |
| Natural, crude | 147 | 255 | France 152; Italy 32; West Germany 31. |
| Iron oxides, processed | 2,477 | 3,051 | West Germany 2,972; Czechoslovakia 40; France 24. |
| Precious and semiprecious stones, including diamond: | | | |
| Natural, crude - thousand carats | 110,260 | 140,445 | Malagasy Republic 53,520; West Germany 36,760; Brazil 21,485. |
| Manufactured do | 73,920 | 87,195 | Switzerland 54,790; France 25,990; Brazil 5,500. |
| Pyrite (gross weight) | 14,614 | 12,470 | U.S.S.R. 12,065; Italy 380; West Germany 25. |
| Salt, including brine salt | 1,179 | 2,296 | All from West Germany. |
| Sand and gravel: | | | |
| Gravel (including crushed rock) | 83,574 | 105,123 | West Germany 90,007; Italy 13,634; Switzerland 857. |
| Sand excluding metal bearing | 216,592 | 242,975 | West Germany 160,916; Czechoslovakia 49,993; East Germany 22,310. |
| Stone, n.e.s.: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous, including marble and limestone | 12,283 | 11,485 | Italy 7,462; West Germany 2,027; Yugoslavia 654. |
| Slate | 1,334 | 2,272 | France 861; West Germany 595; Norway 371. |
| Other | 33,335 | 30,748 | Italy 17,878; Republic of South Africa 5,462; Sweden 2,105. |
| Worked: | | | |
| Paving and flagstone | 12,280 | 13,015 | Yugoslavia 5,013; Romania 4,045; Italy 2,489. |
| Slate | 544 | 851 | Italy 246; Portugal 190; Sweden 137. |
| Other | 7,880 | 9,423 | Italy 8,312; West Germany 658; Switzerland 223. |
| Dolomite, chiefly refractory grade | 5,349 | 4,981 | Italy 3,116; France 830; Norway 538. |
| Limestone, except dimension | 10,812 | 4,349 | West Germany 4,327. |
| Quartz and quartzite | 23,514 | 22,971 | West Germany 16,496; Hungary 3,444; Yugoslavia 1,757. |
| Volcanic material (trass) | 965 | 1,047 | All from West Germany. |
| Sulfur: | | | |
| Elemental, all forms | r 118,619 | 115,315 | Poland 85,672; U.S.S.R. 14,940; West Germany 7,672. |
| Sulfur dioxide | 1,187 | 1,324 | West Germany 1,270; Switzerland 54. |
| Sulfuric acid and oleum | 82,064 | 65,597 | Poland 50,909; West Germany 9,712; Hungary 4,027. |
| Talc, steatite, soapstone, and pyrophyllite | 1,355 | 1,659 | Norway 633; Italy 422; Belgium-Luxembourg 276. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Meerschaum, amber, and jet | 49 | 30 | All from Spain. |
| Other | 40,345 | 45,994 | West Germany 26,533; Hungary 7,562; Bulgaria 7,405. |
| Slag, dross and similar waste, not metal bearing | 22,320 | 29,213 | Italy 18,029; Republic of South Africa 7,022; West Germany 3,031. |
| Oxides and hydroxides of magnesium, strontium, and barium | 926 | 948 | West Germany 828; France 51; United States 38. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 893 | 1,040 | Trinidad and Tobago 657; West Germany 296. |
| Carbon black and gas carbon | r 21,697 | 22,736 | West Germany 10,974; Italy 10,178; United Kingdom 713. |
| Coal: | | | |
| Anthracite and bituminous, including briquets - thousand tons | 2,850 | 2,878 | Poland 1,054; U.S.S.R. 759; Czechoslovakia 709. |
| Lignite and lignite briquets do | 922 | 845 | Yugoslavia 425; East Germany 215; West Germany 156. |

See footnotes at end of table.

Table 3.—Austria: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Coke and semicoke -- thousand tons -- | 906 | 1,052 | Czechoslovakia 587; Poland 184; West Germany 122. |
| Gas, natural ---------- do ---- | 1,210 | 1,211 | U.S.S.R. 1,186; West Germany 19; Switzerland 2. |
| Hydrogen, helium, and rare gases thousand cubic feet -- | 21,320 | 36,346 | West Germany 34,570; Switzerland 1,193. |
| Peat, including peat briquets and litter | 21,939 | 28,465 | West Germany 12,035; Poland 7,083; U.S.S.R. 5,216. |
| Petroleum: | | | |
| Crude and partly refined oils: | | | |
| Crude thousand 42-gallon barrels -- | r 38,697 | 44,911 | Iraq 18,717; Iran 8,275; U.S.S.R. 7,131. |
| Partly refined ------- do ---- | r 3,540 | 1,842 | Romania 1,015; Czechoslovakia 414; Poland 408. |
| Refinery products: | | | |
| Gasoline, aviation and motor do ---- | 7,151 | 8,919 | Italy 3,375; West Germany 2,484; Czechoslovakia 1,378. |
| Kerosine ---------- do ---- | 1 | 2 | Mainly from Netherlands. |
| Distillate fuel oil ----- do ---- | 79 | 500 | West Germany 168; Italy 159; Romania 137. |
| Residual fuel oil ------ do ---- | 10,613 | 12,421 | West Germany 4,412; Italy 2,801; Switzerland 1,403. |
| Lubricants ---------- do ---- | r 555 | 837 | Hungary 279; West Germany 135; Netherlands 123. |
| Mineral jelly and wax - do ---- | 92 | 109 | West Germany 56; Hungary 22; East Germany 12. |
| Other ---------- do ---- | r 2,186 | 2,299 | West Germany 1,091; Italy 718; Czechoslovakia 140. |
| Total ---------- do ---- | r 20,677 | 25,087 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ----- | 10,895 | 10,392 | U.S.S.R. 3,612; West Germany 3,120; Czechoslovakia 1,645. |

r Revised. NA Not available.
1 Includes spiegeleisen, shot, powder, and sponge.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Production of primary aluminum in 1974 was 91,554 tons, an increase of about 3% over the 89,131 tons produced in 1973. The country's primary aluminum smelter capacity remained the same (92,000 tons) as in 1973.

Production of aluminum semiproducts in Austria rose to about 103,000 tons. This increase was obtained by the startup of the new cold-rolling mill of Vereinigte Metallwerke Ranshofen-Berndorf AG (VMRB). Planned expansions in the extrusions sector were deferred in view of the unfavorable situation in the building industries.

**Copper.**—During 1974 Austria remained a modest producer of copper ore, concentrate, and electrolytic copper. Output of copper (metal content of ore) was 2,687 tons compared with 2,742 tons in 1973.

**Iron and Steel.**—Iron ore output of 4,245,400 tons was slightly higher (+0.8%) than the previous record high of 4,210,500 tons set in 1973. Imports of iron ore in 1974 were about the same magnitude as the domestic output. Pig iron production increased from 3,005,689 tons in 1973 to 3,443,114 tons in 1974. Crude steel production rose from 4,238,085 to 4,698,519 tons.

VÖEST-Alpine AG, of Linz, completed its 1970–74 investment program, which included as major projects the opening of a third Linz-Donawitz (LD) steel mill raising the crude steel output of the company by 1.1 million to 3.3 million tons and a modern ore-dressing plant. Other developments were a new thermal unit, a second cold-rolling mill, and improvements in the field of environmental protection. Further expansion of metallurgical plants and finishing departments has been planned for the years 1975 through 1978.

**Lead and Zinc.**—Extraction of lead and zinc in 1974 was somewhat lower than in 1973, with production in terms of the lead

content of ore decreasing from 6,139 to 5,785 tons, and production of metal content of zinc ore decreasing from 22,151 to 20,977 tons.

**Tungsten.**—Production of tungsten will be resumed in Austria when a new tungsten mining operation and integrated tungsten plant are completed. The newly founded Wolfram Ges. mbH, in which interests are held by Austria's VÖEST-Alpine AG, the West German firm Deutsche Metallgesellschaft AG, and the U.S. company Teledyne, Inc., has its headquarters at Pölfing-Bergla, Styria. The open pit mine, which will produce relatively low-grade ore containing about 0.7% tungsten trioxide, is at Mittersill. Ore will be shipped to Bergla for refining. A former coal mining site is to be rehabilitated for the new tungsten refinery. Annual capacity will be equal to 15% to 20% of estimated European demand. About 75% of the annual output will be exported.

**Other Metals.**—Other metals produced in Austria in 1974 were antimony, cadmium, and germanium.

## NONMETALS

**Cement.**—Austria in 1974 produced 6,425,000 tons of cement compared with 6,260,000 tons in 1973 and the previous record high of 6,345,000 tons set in 1972.

Perlmooser Zementwerke AG reported on results of the company's operating experience with a rotary cooler and a grate cooler. At the Rodaun plant a rotary cooler (4.40 meters in diameter, 46 meters in length) was selected for its operational reliability, wear, and reduction of pollution. The thermal efficiency in performance tests attained a value of 69.4% at a 2,029-ton-per day kiln output and a 781-kilocalorie heat consumption per kilogram of clinker (natural gas firing); the specific power consumption of the cooler was 3.49 kilowatt-hours per ton of clinker. The final temperature of the clinker was 160°C on average, in conjunction with up to 50 gallons of water sprayed per kilogram of clinker.

With regard to modifications to increase the output of a preheater kiln, the cooling capacity at the Mannersdorf plant was successfully stepped up from 1,650 to 2,100 tons per day by the use of a grate cooler for aftercooling. The measurements performed, which showed that about 70.7% of the clinker heat entering the grate cooler was dissipated by the cooling air and by radiation, confirm the cooling effect achieved. The specific power consumption of the cooler is about 1.14 kilowatt-hours per ton of clinker. The clinker exit temperature was lowered from 238° to 76° C. The specific consumption of cooling air to achieve this was 1.69 Normal cubic meters per kilogram of clinker.[2]

**Clays.**—Austria produced 387,758 tons of illite, 312,425 tons of crude kaolin, and 155,248 tons of other clays (including clay sand) in 1974. Illite production was up about 19% from the previous year's 327,168 tons, and kaolin production increased nearly 4% over the 300,742 tons produced in 1973.

**Graphite.**—Crude graphite production in 1974 was 29,550 tons, an increase of nearly 72% over the 17,211 tons produced in 1973.

**Gypsum and Anhydrite.**—Austria produced 803,742 tons of crude gypsum and anhydrite in 1974, a decrease of about 8% from the 871,001 tons produced in 1973.

**Magnesite.**—Output of crude magnesite increased from the 1,418,628 tons produced in 1973 to 1,449,125 tons in 1974; production of sintered or dead-burned magnesite increased from 485,214 tons to 547,193 tons; caustic-calcined magnesite declined from 179,508 to 157,112 tons.

**Other Nonmetals.**—In 1974 Austria also produced a variety of other nonmetals including barite, diatomite, lime, quartz and quartzite, quartz sand, salt, sand and gravel, stone, sulfur, talc, and pumice (trass).

## MINERAL FUELS

Austria continued to be a modest producer of low-rank coals, crude oil, and natural gas. Domestic supplies were not adequate to meet the country's requirements and imports were necessary to satisfy the demand for energy.

Total electric power generation in 1974, according to preliminary figures published by the Federal Grid Authority, was 33,874 million kilowatt-hours. Of this total, water power accounted for 22,646 million kilowatt-hours, while thermal plants generated 11,228 million kilowatt-hours. Water supply during the year was favorable. Imports of power were reduced to 3,169 million kilowatt-hours, while exports increased to 6,126

[2] Rock Products. V. 77, No. 12, December 1974, p. 32.

million kilowatt hours. The total amount available for domestic supply, including transmission losses, the requirements of the Ranshofen aluminum works, and pumped storage, was 30,917 million kilowatt-hours; consumption, including transmission losses but excluding the Ranshofen aluminum works requirements, and pumped storage, was 28,754 million kilowatt-hours.

**Coal.**—Austria's coal production, which since 1968 has been confined to brown (subbituminous) coal, totaled 3,629,284 tons, a slight decrease from the 3,634,008 tons produced in 1973.

To meet its coal and coke requirements, Austria continued to rely on imports. Total consumption of solid fuels increased during 1974 with decreased consumption registered only by the transportation industry and households.

**Petroleum and Natural Gas.**—Crude oil production in Austria in 1974 was 2,238,144 tons, a decrease of 13% from that of the preceding year. Production of natural gas fell from 2,270 million cubic meters in 1973 to 2,207 million cubic meters in 1974, a decrease of 3%.

Domestic consumption of petroleum and petroleum products fell from 11,325,548 tons in 1973 to 10,171,827 tons in 1974, a decrease of 10.2%. Major consumption declines were reported for lubricants (down 30.6%), kerosine (down 28.9%), white spirit and special gasoline (down 18.7%), and residual fuels (down 13%). The chief reason for the decline in consumption was higher prices for all petroleum products. Other factors were the relatively mild winters of 1973–74 and 1974–75, as well as a number of Government measures aimed at conservation of energy. These measures included a regulation under which motorists were required not to drive on 1 day per week for a 5-week period early in 1974. Speed limits were introduced on public roads which remained in effect (130 kilometers on superhighways, 100 kilometers on other roads).[3]

A study undertaken jointly by Austromineral company and Österreichische Mineralölverwaltung AG (ÖMV–AG), both of Vienna, indicated that the volume of all petroleum deposits so far explored in Austria has been estimated at 285 million to 300 million tons, 35% of which could be extracted by current methods. Explored deposits of natural gas totaled some 75,000 million cubic meters, of which approximately 60% could be extracted. Strata at an unexplored depth between 6,000 and 10,000 meters were believed to hold another 115 million to 135 million tons of petroleum and 142,000 million to 165,000 million cubic meters of natural gas. Production costs, as far as these reserves were concerned, would be of the order of British and Norwegian North Sea operations.[4]

A new agreement with the Soviet Union on the annual delivery to Austria of 500 million cubic meters of natural gas from 1978 to 2000 was signed. This would increase the volume of Austrian imports of natural gas from 1.5 billion to 2.0 billion cubic meters per year. The agreement gives Austria an option for another 500 million cubic meters per year. VÖEST-Alpine in 1975 will start delivering to the Soviet Union a total of 200,000 tons of pipeline pipe.[5]

The Transaustria gas pipeline (TAG), which crosses Austria from the Czechoslovak to the Italian border, was completed on schedule after a construction period of about 30 months. On May 1, 1974, Soviet natural gas was pumped through the pipeline to Italy; official opening ceremonies were held on May 20. In addition to supplying Soviet gas to Italy and Austria, the pipeline will eventually supply gas to France through a connection at Gemona in northern Italy with the Monfalcone-Karlsruhe (MOKA) pipeline planned to extend from Monfalcone, Italy, through western Austria to Karlsruhe, West Germany.

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[3] U.S. Embassy, Vienna, Austria. Austrian Consumption of Petroleum Products Declined 10% in 1974. State Department Airgram A–100, Mar. 14, 1975, 2 pp.

[4] Österreichische Länderbank. Petroleum and Natural Gas Reserves. Länderbank Econ. Bull. (Vienna), November 1974, p. 7.

[5] Österreichische Länderbank. New Natural Gas Agreement with U.S.S.R. Länderbank Econ. Bull. (Vienna), January 1975, p. 5.

# The Mineral Industry of Belgium and Luxembourg

By Norman A. Matthews [1]

The overall performance of the Belgian economy surpassed the average for the European Communities (EC) during the year but was beset by a high inflation rate (15%) and increasing unemployment, problems common to most of the developed countries of the Western World. The industrial production index increased 6.2% in 1974, compared with a 6.0% increase in 1973. Reflecting inflated prices of domestic production and exports, the gross national product (GNP) at $53.1 billion [2] was 18.3% above that of 1973. In real terms the GNP increase was 4.5%. The high level of industrial production was stimulated by business investment and domestic and export demand, with housing construction the weakest segment in the economy.

The economic outlook deteriorated substantially in September and prompted the new government, elected in May, to institute additional measures to slow inflation and, at the same time, to arrest the increase in unemployment. These measures were not successful however, since export demand promptly declined and necessitated curtailment in production of major export items such as steel, nonferrous metals, petroleum products, and most petrochemicals.

Unemployment reached 3.8% in June and 5.9% at yearend, the highest figures in recent years. The overall inflation rate of 15% was influenced substantially by wage increases of 20%, wholesale price increases of 11%, and retail price increases of 15%, compared with those of 1973. The balance of trade showed a modest deficit during the year. The substantial increases in export and import values were a reflection of higher prices. Imports from the United States increased 78% in value, reflecting higher prices for agricultural and mineral commodities and high-technology goods.

The overall extractive mineral production index declined in 1974, reflecting principally the downward trend in coal production; crushed stone and marble production also declined, whereas industrial sand production increased. Nevertheless, Belgium and Luxembourg continued to increase the volume of imported raw materials converted to high-value semifinished products such as steel, nonferrous metals, and petrochemicals. Record volumes were achieved in all these and their derivative industries such as metal fabrication and plastic products, which constitute an increasing share of the industrial economy and value of exports.

## BELGIUM

### PRODUCTION

Overall the industrial production index in 1974 exceeded that of 1973 by 6.2% with most of the excess occurring in the first 6 to 9 months of the year. For example, raw steel production during the first 6 months was at the annual rate of 17.3 million tons, or 11.7% higher than the annual rate in 1973, whereas production for 1974 as a whole was 16.2 million tons, exceeding the 1973 total by only 4.6%. Export demand weakened in September and some mills reduced output immediately; curtailment of shipments by 10% to 20% during the last quarter mostly affected those plants highly dependent on export markets.

[1] Physical scientist, Division of Ferrous Metals.
[2] Where necessary, values have been converted from Belgian francs (BF) to U.S. dollars at the rate of BF 38.96=U.S.$1.00, the approximate floating average during the year.

Similar softening of nonferrous metal markets developed generally in September and October in Europe, and the major Belgian producers announced curtailment of zinc and copper production in December. Nevertheless, record shipments were achieved in most mineral and metal commodities during the year. Exceptions involved coal production where the planned closing of some mines continued. A policy decision was made during 1974 to review the investment costs needed to increase production in the more efficient mines. Similarly, through substantial conservation efforts, the demand for crude petroleum was reduced. Imposition of price controls on domestic oil products further reduced refinery throughput of crude oil in March and April. Relative production in 1974 and 1973 of some of the most important commodities was as follows, with 1973 figures in parentheses and the percentage increase (+) or decrease (−) shown: Coal, 8,111,000 tons (8,842,000), −8%; marble quarried, 3,000 cubic meters (3,431), −12%; sand production, 17,560,000 tons (15,876,000), +10%; crude petroleum processed, 30,213,000 tons (37,005,000), −19%; gasoline production, 4,040,000 tons (4,767,000), −15%; production of nitrogen for fertilizers 420,000 tons (361,000), +16%; coke production, 8,052,000 tons (7,801,000), +3.0%; cement production, 7,435,000 tons (7,041,000), +6.0%; wrought steel products, 12,253,000 tons (11,448,000), +7.0%; nonferrous metals (copper, zinc, and lead) production, 811,000 tons (783,143) +3%; and aluminum wrought products, 263,000 tons (267,430), −2%.

Productivity increased substantially, as production increases were achieved with little increase in personnel and a corresponding reduction in the average hours worked.

A rapidly growing area of industrial activity involved the provision of heavy steel components for oil and gas development and production in the North Sea. An increasing number of Belgian firms were engaged as subcontractors in the provision of steel subassemblies, electrical machinery, work boats, steam generators, and other subassemblies or machinery. To a large extent these increasing outlets for steel offset the decline in exports of steel for automobile and commercial building construction during 1974.

**Table 1.—Belgium: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| METALS | | | |
| Aluminum metal, secondary only | [r] 2,900 | 7,000 | [e] 7,000 |
| Cadmium | [r] 1,128 | 1,147 | 1,043 |
| Copper: | | | |
| Blister | 13,000 | 16,000 | [e] 16,000 |
| Refined, including alloys | [r] 327,278 | 372,276 | 388,300 |
| Iron and steel: | | | |
| Iron ore and concentrate thousand tons | [r] 114 | 115 | 123 |
| Pig iron do | 11,772 | 12,656 | 13,020 |
| Ferroalloys do | 123 | 111 | 116 |
| Steel: | | | |
| Crude do | [r] 14,532 | 15,522 | 16,233 |
| Semimanufactures do | [r] 11,729 | 12,601 | 13,179 |
| Lead metal: | | | |
| Primary | [r] 97,400 | 103,000 | 99,600 |
| Secondary | [r] 9,232 | 9,360 | [e] 13,656 |
| Total | [r] 106,632 | 112,360 | [e] 113,256 |
| Tin metal: | | | |
| Primary long tons | 3,861 | 3,611 | 3,364 |
| Secondary do | [r] 1,843 | 1,804 | [e] 913 |
| Total do | [r] 5,704 | 5,415 | [e] 4,277 |
| Zinc metal: | | | |
| Primary | [r] 254,104 | 275,807 | NA |
| Secondary (remelted zinc) | [r] 5,600 | 6,700 | NA |
| Total | [r] 259,704 | 282,507 | 293,567 |
| Other nonferrous metals: | | | |
| Precious metals, unworked, not further specified [2] thousand troy ounces | [r] 25,796 | 25,960 | 36,332 |

See footnotes at end of table.

## Table 1.—Belgium: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| METALS—Continued | | | | |
| Other nonferrous metals—Continued | | | | |
| Unspecified base metals [3] | | [r] 3,108 | 4,077 | [e] 5,448 |
| NONMETALS | | | | |
| Cement, hydraulic | thousand tons | 7,090 | 7,041 | 7,435 |
| Clays, n.e.s. | do | 291 | 408 | 240 |
| Fertilizer materials, manufactured: | | | | |
| Nitrogenous, nitrogen content | do | 397 | 361 | [e] 420 |
| Phosphatic, gross weight: | | | | |
| Thomas slag | do | 1,398 | 1,358 | [e] 1,375 |
| Superphosphatic, ordinary | do | 188 | 218 | [e] 248 |
| Other | do | 534 | 517 | [e] 555 |
| Gypsum and anhydrite, calcined | | 105,979 | 114,038 | 102,204 |
| Lime and dead-burned dolomite: | | | | |
| Quicklime | thousand tons | [r] 2,873 | 3,098 | [e] 3,248 |
| Dead-burned dolomite | do | 349 | 322 | [e] 330 |
| Sodium, sodium compounds, n.e.s., sodium carbonate [e] | | 355,000 | 390,000 | 400,000 |
| Stone, sand and gravel: | | | | |
| Calcareous: | | | | |
| Dolomite | thousand tons | 1,788 | 2,191 | [e] 2,565 |
| Limestone | do | 24,376 | 23,938 | 23,777 |
| Marble: | | | | |
| In blocks | cubic meters | 4,310 | 3,431 | 2,654 |
| Crushed and other | | 14,644 | 10,655 | 9,880 |
| Petit granite (Belgian bluestone): | | | | |
| Quarried | cubic meters | 298,253 | 297,702 | 361,470 |
| Sawed | do | 72,986 | 68,021 | 70,860 |
| Worked | do | 11,402 | 9,230 | 11,799 |
| Crude and other | do | 238,476 | 231,855 | 346,972 |
| Porphyry, all types | thousand tons | 8,048 | 6,922 | 5,487 |
| Quartzite | | 506,028 | 433,992 | 440,295 |
| Sand and gravel: | | | | |
| Construction sand | thousand tons | 10,325 | 9,586 | 11,484 |
| Foundry sand | do | 1,321 | 1,358 | 1,412 |
| Dredged sand | do | 873 | 701 | [e] 968 |
| Glass sand | do | 1,607 | 1,767 | 1,921 |
| Other sand | do | 2,236 | 2,469 | 2,893 |
| Gravel dredged | do | 6,391 | 6,214 | [e] 6,400 |
| Sandstone: | | | | |
| Rough stone, including crushed | thousand tons | 2,216 | 2,142 | 2,298 |
| Paving and mosaic stone | | [r] 1,141 | 758 | 554 |
| Other | | 48,676 | 45,291 | 48,664 |
| Slate, roofing and other | | 5,611 | 3,215 | 3,569 |
| Sulfur, byproduct: | | | | |
| Elemental | | 25,000 | 30,000 | [e] 30,000 |
| Other forms | | 185,000 | 205,000 | [e] 205,000 |
| Total | | 210,000 | 235,000 | [e] 235,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Coal: | | | | |
| Anthracite | thousand tons | [r] 2,956 | 2,503 | 2,038 |
| Bituminous | do | [r] 7,544 | 6,339 | 6,073 |
| Total | do | 10,500 | 8,842 | 8,111 |
| Coke, all types | do | 7,239 | 7,801 | 8,052 |
| Fuel briquets, all kinds | do | 496 | 456 | 417 |
| Gas: | | | | |
| Manufactured | million cubic feet | 67,729 | 35,194 | [e] 35,724 |
| Natural | do | 3,708 | 3,860 | [e] 3,500 |
| Carbon black [e] | | 2,000 | 2,000 | 2,000 |
| Petroleum, refinery products: | | | | |
| Gasoline | thousand 42-gallon barrels | 38,556 | 40,429 | [e] 31,930 |
| Jet fuel | do | 9,608 | 9,614 | [e] 4,071 |
| Kerosine | do | 1,139 | 1,131 | [e] 2,816 |
| Distillate fuel oil | do | 86,730 | 89,936 | [e] 72,411 |
| Residual fuel oil | do | 89,484 | 83,442 | [e] 69,791 |
| Lubricants | do | 686 | 294 | [e] 250 |
| Other | do | 30,260 | 33,858 | [e 4] 26,651 |
| Refinery fuel and losses | do | 12,038 | 10,597 | [e] 8,517 |
| Total | do | 268,501 | 269,301 | [e] 216,437 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed individually, Belgium produces a number of other metals for which only aggregate output figures are available. These aggregates are listed under other nonferrous metals.

[2] Known to include gold and silver and may include platinum-group metals.

[3] Derived by subtracting aluminum data from a reported total for unspecified base metals.

[4] Includes the following petroleum refinery products: Liquefied petroleum gas—4,231; asphalt—5,520; pitch—2,946; white spirit—1,821; unspecified—12,133.

## TRADE

Belgium and Luxembourg trade and economic statistics are consolidated and reported as statistics for the Belgium-Luxembourg Economic Union (BLEU). The record GNP in 1974, representing an 18.3% increase compared with that of 1973, was sustained by a modest increase in import and export volumes but at greatly inflated prices. As a result, imports and exports increased 25% and 35% respectively in value, and a modest deficit in trade value developed and was attributable to a large extent to the much higher prices for crude petroleum, animal feed grains, and fertilizer raw materials.

Western Europe, principally the countries of the enlarged EC, accounted for approximately 74% of the exports and 69% of the imports. West Germany, France, and the Netherlands continued as the principal trading partners, accounting for over 60% of the foreign trade. The substantial surplus in trade values with the European nations was more than offset by the deficits associated with crude petroleum imports at the high prices prevailing in 1974. Exports to and imports from the United States increased in value 22% and 78%, respectively, with the great increase in import value associated with the much higher prices of feed grains, phosphate rock, coal, and other raw materials. Economic stagnation among the major trading partners led to stringent economic measures being applied by the Government late in the year to dampen domestic demand, particularly for imported goods, and to reduce inflation. Similar actions by the principal trading countries began late in the year when inventories of steel and nonferrous metals climbed to such an extent that production curtailment was necessary.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 362 | 247 | Republic of South Africa 98; France 31; Switzerland 30. |
| Oxide and hydroxide | 153 | 92 | West Germany 56; France 6; Switzerland 2. |
| Ash and residue containing aluminum | 1,424 | 2,083 | West Germany 1,508; France 556. |
| Metal including alloys: | | | |
| Scrap | 17,507 | 20,171 | France 11,293; Netherlands 3,473; West Germany 2,723. |
| Unwrought | 8,446 | 20,220 | Netherlands 11,878; France 4,733; West Germany 2,556. |
| Semimanufactures | 165,456 | 182,045 | West Germany 45,276; France 36,361; Netherlands 22,030. |
| Antimony: | | | |
| Ore and concentrate | 57 | -- | |
| Metal including alloys, all forms | 33 | 73 | West Germany 48; France 24. |
| Arsenic, natural sulfides | 247 | 23 | NA. |
| Beryllium metal including alloys, all forms kilograms | 100 | -- | |
| Bismuth metal including alloys, all forms | 583 | 721 | France 593. |
| Cadmium metal including alloys, all forms | r 1,142 | 1,033 | West Germany 403; United States 280; France 230. |
| Chromium: | | | |
| Chromite | r 5,994 | -- | |
| Oxide, hydroxide, and trioxide | r 55 | 119 | France 32; Netherlands 26; West Germany 12. |
| Metal including alloys, all forms | 15 | 48 | NA. |
| Copper: | | | |
| Ore and concentrate | 1,944 | 42 | NA. |
| Matte | 130 | 2,141 | France 1,155; United States 669; United Kingdom 21. |
| Copper sulfate | 7,873 | 7,777 | Denmark 2,380; Netherlands 1,961; Norway 1,371. |
| Ash and residue containing copper | 5,268 | 4,590 | West Germany 3,110; United Kingdom 617; Netherlands 353. |
| Metal including alloys: | | | |
| Scrap | 10,551 | 18,741 | West Germany 6,704; France 3,788; Italy 2,842. |
| Unwrought | r 271,464 | 326,235 | France 133,888; West Germany 76,554; United Kingdom 25,195. |
| Semimanufactures | 131,169 | 158,076 | West Germany 46,471; Netherlands 45,697; France 27,751. |
| Germanium metal including alloys, all forms | 39 | 8 | Italy 3; France 2; Hungary 1. |

See footnotes at end of table.

## Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Gold: | | | |
| Waste and sweepings value, thousands | $7 | $141 | France $84; United Kingdom $49. |
| Metal, unworked or partly worked thousand troy ounces | r 446 | 455 | West Germany 147; United Kingdom 114; Switzerland 114. |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite—thousand tons | 3 | 77 | Mainly to France. |
| Roasted pyrite ——— do | 158 | 169 | Mainly to West Germany. |
| Metal: | | | |
| Scrap ——— do | 394 | 559 | West Germany 223; France 201; Netherlands 62. |
| Pig iron, including cast iron do | 10 | 17 | France 9; West Germany 7. |
| Sponge iron, powder shot | 188 | 752 | Netherlands 193; West Germany 167; France 161. |
| Spiegeleisen | 777 | 1,388 | West Germany 876; France 186; Greece 116. |
| Ferroalloys: | | | |
| Ferromanganese thousand tons | 57 | 59 | West Germany 23; France 14; Italy 10. |
| Other ——— do | 7 | 29 | France 17; West Germany 8; Romania 2. |
| Steel, primary forms—do | 2,211 | 2,422 | France 1,030; West Germany 451; Netherlands 283. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections ——— do | 5,729 | 6,466 | West Germany 1,485; France 1,061; Netherlands 649. |
| Universals, plates, sheets do | 4,871 | 5,335 | France 1,589; West Germany 1,298; Netherlands 531. |
| Hoop and strip—do | 848 | 922 | West Germany 294; France 266; Switzerland 68. |
| Rails and accessories do | 81 | 102 | Italy 26; France 20; Portugal 10. |
| Wire ——— do | 413 | 450 | West Germany 89; United States 76; France 65. |
| Tubes, pipes, fittings do | 312 | 327 | West Germany 93; France 73; Netherlands 65. |
| Castings and forgings, rough ——— do | 43 | 39 | West Germany 11; Netherlands 6; France 4. |
| Lead: | | | |
| Ore and concentrate | 23 | 526 | NA. |
| Oxides | 4,849 | 5,856 | Netherlands 2,731; West Germany 2,016; France 339. |
| Ash and residue containing lead | 5,861 | 2,745 | West Germany 1,860; Netherlands 792. |
| Metal including alloys: | | | |
| Scrap | 8,919 | 10,262 | France 5,448; West Germany 2,516; Netherlands 1,311. |
| Unwrought | 46,596 | 68,016 | Netherlands 20,124; France 16,021; West Germany 8,930. |
| Semimanufactures | 6,602 | 4,915 | Netherlands 2,471; Sweden 434; France 411. |
| Magnesium metal including alloys: | | | |
| Scrap | 498 | 397 | United States 205. |
| Unwrought and semimanufactures | 220 | 194 | NA. |
| Manganese: | | | |
| Ore and concentrate | 3,040 | 2,846 | Netherlands 1,330; West Germany 430; France 295. |
| Metal | 58 | 113 | Netherlands 27; United Kingdom 21; West Germany 20. |
| Mercury ——— 76-pound flasks | 577 | 1,459 | France 1,326; Netherlands 55; West Germany 23. |
| Molybdenum: | | | |
| Ore and concentrate | 1,601 | 2,376 | West Germany 259; Spain 215; Italy 189. |
| Metal, including alloys, all forms | 33 | 84 | Austria 61; West Germany 12; France 8. |
| Nickel: | | | |
| Matte, speiss, similar materials | 23 | 25 | NA. |
| Metal including alloys: | | | |
| Scrap | 1,708 | 1,970 | West Germany 860; United Kingdom 568; Canada 219. |
| Unwrought | 165 | 213 | West Germany 70; United Kingdom 60; Netherlands 32. |
| Semimanufactures | 927 | 764 | NA. |

See footnotes at end of table.

## Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Platinum-group metals including alloys, all forms -- thousand troy ounces -- | 67 | 76 | West Germany 50; France 13; Netherlands 4. |
| Selenium, elemental ----- kilograms -- | 66,700 | 49,100 | Netherlands 24,800; West Germany 11,200; France 7,000. |
| Silver metal including alloys thousand troy ounces -- | r 166,010 | 22,560 | West Germany 7,525; United Kingdom 4,817; France 4,030. |
| Tin: | | | |
| Ore and concentrates -- long tons -- | 846 | 221 | Mainly to Spain. |
| Oxides ---------- do ---- | 247 | 136 | France 98; West Germany 26; Netherlands 6. |
| Metal, including alloys: | | | |
| Scrap ---------- do ---- | 88 | 136 | Mainly to Netherlands. |
| Unwrought ---------- do ---- | r 2,074 | 1,910 | Turkey 462; West Germany 441; France 389. |
| Semimanufactures ---- do ---- | 91 | 371 | West Germany 149; Arab Republic of Yemen 10; People's Democratic of Yemen 10. |
| Titanium: | | | |
| Ore and concentrate ---------- | 648 | 82 | NA. |
| Oxides ---------- | 26,670 | 28,942 | West Germany 9,549; France 5,433; United States 1,573. |
| Metal including alloys, all forms -- | 35 | 17 | NA. |
| Tungsten: | | | |
| Ore and concentrate ---------- | 163 | 88 | United Kingdom 47; United States 26; Republic of South Africa 15. |
| Metal including alloys, all forms -- | 19 | 59 | Netherlands 27; France 4. |
| Uranium and thorium ore and concentrate ---------- | 30 | 1 339 | Mainly to France 4. |
| Vanadium oxides -------- kilograms -- | 1,700 | 13,200 | NA. |
| Zinc: | | | |
| Ore and concentrate ---------- | 57,704 | 50,579 | West Germany 24,917; France 15,130; Norway 4,034. |
| Oxides ---------- | -- | 7,201 | Netherlands 2,218; United States 1,569; West Germany 730. |
| Ash and residue containing zinc ---- | 24,969 | 52,932 | Netherlands 39,760; West Germany 6,369; France 3,444. |
| Metal including alloys: | | | |
| Scrap ---------- | 7,350 | 9,045 | Mainly to France. |
| Blue powder (dust) ---------- | 28,025 | 28,420 | West Germany 11,092; France 4,464; Netherlands 2,062. |
| Unwrought ---------- | 192,679 | 221,678 | West Germany 73,406; United States 35,823; France 31,119. |
| Semimanufactures ---------- | 8,951 | 8,703 | West Germany 3,154; Netherlands 2,572; France 472. |
| Other: | | | |
| Ore and concentrate: | | | |
| Of columbium, tantalum, vanadium, zirconium -------- | 15 | 132 | Italy 50; United States 25; West Germany 24. |
| Of precious metals ---------- | 10 | -- | |
| Of base metals, n.e.s ---------- | 122 | 73 | West Germany 6. |
| Ash and residue containing nonferrous metals, n.e.s -------- | 36,012 | 29,396 | West Germany 4,615; United Kingdom 1,204; France 386. |
| Waste and sweepings of precious metals ----- value, thousands -- | r $1,270 | $1,406 | West Germany $893; United Kingdom $340; France $171. |
| Oxides, hydroxides, peroxides of metals, n.e.s ---------- | r 4,704 | 5,636 | West Germany 2,187; Netherlands 763; France 669. |
| Metals including alloys, all forms: | | | |
| Metalloids: | | | |
| Tellurium and arsenic ---- | 15 | 30 | West Germany 10; Japan 5; Netherlands 5. |
| Other ---------- | 229 | 142 | France 10. |
| Alkali, alkaline earth, rare-earth metals ---------- | 394 | 69 | NA. |
| Pyrophoric alloys kilograms -- | 500 | 100 | NA. |
| Base metals including alloys, all forms, n.e.s ---------- | 11,126 | 17,261 | Austria 90; France 1; United Kingdom 1. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc ---------- | 4,237 | 2,952 | NA. |

See footnotes at end of table.

## Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Abrasives, natural, n.e.s.—Continued | | | |
| Dust and powder of precious and semiprecious stones, natural and manufactured ____ kilograms | 394 | 710 | United Kingdom 133; Israel 129; United States 105. |
| Grinding and polishing wheels and stones | 2,450 | 2,781 | France 1,333; West Germany 464; United Kingdom 287. |
| Asbestos | 778 | 433 | France 222; Netherlands 40. |
| Barite and witherite | 61 | 6,887 | Mainly to Netherlands. |
| Boron materials: | | | |
| Crude natural borates | 4,023 | 4,097 | Netherlands 1,958; France 1,506; West Germany 443. |
| Oxide and acid | 31 | 1,305 | West Germany 643; Italy 457. |
| Bromine ____ kilograms | -- | 300 | NA. |
| Cement ____ thousand tons | 1,586 | 1,652 | Netherlands 1,154; Nigeria 57; Saudi Arabia 48. |
| Chalk | 98,662 | 82,353 | Netherlands 44,682; France 11,689; West Germany 5,254. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 10 | 97 | NA. |
| Kaolin | 10,981 | 15,175 | Netherlands 10,125; France 3,419; United Kingdom 220. |
| Other | 8,150 | 6,456 | Netherlands 3,263; France 1,380; Italy 325. |
| Products: | | | |
| Refractory (including nonclay brick) | 100,443 | 102,130 | France 61,978; Italy 9,475; West Germany 6,519. |
| Nonrefractory value, thousands | $16,459 | $22,087 | Netherlands $8,054; West Germany $5,169; France $5,166. |
| Cryolite and chiolite | 1,179 | 1,140 | NA. |
| Diamond: | | | |
| Gem: | | | |
| Unworked -- thousand carats | 6,151 | 5,733 | India 2,064; Israel 1,325; United Kingdom 1,312. |
| Worked ____ do | 2,389 | 2,503 | United States 942; West Germany 275; Hong Kong 228. |
| Industrial: | | | |
| Unworked ____ do | 7,289 | 8,865 | United States 2,453; United Kingdom 1,794; Ireland 1,170. |
| Worked ____ do | 15 | 90 | Mainly to United Kingdom. |
| Diatomite and other infusorial earth | 673 | 900 | France 535; West Germany 152; Netherlands 132. |
| Feldspar, leucite, nepheline, nepheline syenite | 639 | 6,849 | Mainly to Netherlands. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 363 | 957 | France 594; West Germany 347. |
| Phosphatic | 45,421 | 34,114 | West Germany 9,775; United Kingdom 7,347; Netherlands 5,506. |
| Potassic, $K_2O$ content | 61 | 126 | NA. |
| Manufactured: | | | |
| Nitrogenous, $N_2$ content ___ thousand tons | 296 | 369 | France 121; West Germany 62; Egypt 27. |
| Phosphatic, $P_2O_5$ content do | 347 | 335 | France 134; West Germany 98; Netherlands 27. |
| Potassic, $K_2O$ content - do | 198 | 253 | Norway 46; France 45; Netherlands 30. |
| Other, including mixed do | 1,216 | 1,385 | France 939; United Kingdom 49; Turkey 42. |
| Ammonia ____ do | 170 | 170 | Mainly to France. |
| Fluorspar | 531 | 557 | NA. |
| Graphite, natural | 130 | 148 | NA. |
| Gypsum and plasters | 11,483 | 31,635 | West Germany 20,606; Netherlands 9,600; France 568. |
| Lime ____ thousand tons | 687 | 729 | Mainly to Netherlands. |
| Magnesite | 1,178 | 1,669 | West Germany 212; Canada 14. |
| Mica: | | | |
| Crude, including splittings and waste | 87 | 132 | NA. |
| Worked, including agglomerated splittings | 787 | 1,170 | United States 297; United Kingdom 231; West Germany 163. |

See footnotes at end of table.

## Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Pigments, mineral, including processed iron oxides | r 1,960 | 4,165 | France 2,228; Italy 1,236; West Germany 80. |
| Precious and semiprecious stones: | | | |
| Natural (except diamond): | | | |
| Unworked ------ kilograms | 11,019 | 11,308 | United States 4,524; Switzerland 3,384; Netherlands 1,037. |
| Worked: | | | |
| Gem ---------- do | 133 | 186 | Netherlands 94; United Kingdom 22; France 5. |
| Industrial -------- do | 34 | 10 | NA. |
| Manufactured [2] ---------- do | 22 | 169 | France 103; United States 21; United Kingdom 7. |
| Pyrite (gross weight) | 5,233 | 1,235 | NA. |
| Salt and brine | 30,565 | 150,199 | France 98,113; West Germany 42,315. |
| Sodium and potassium compounds thousand tons | 16,418 | 415 | Netherlands 118; West Germany 57; France 53. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous ------- do | 909 | 1,028 | Mainly to Netherlands. |
| Slate ---------- do | 3 | 3 | Do. |
| Other ---------- do | r 49 | 64 | Do. |
| Worked: | | | |
| Slate ---------- do | 1 | 1 | Mainly to West Germany and Netherlands. |
| Paving and flagstone do | 3 | 8 | Mainly to Netherlands. |
| Other ---------- do | 10 | 12 | West Germany 4; Netherlands 2; France 2. |
| Dolomite, chiefly refractory grade ---------- do | r 1,315 | 1,545 | West Germany 668; Netherlands 645; France 103. |
| Gravel and crushed rock -- do | 7,732 | 8,598 | France 3,965; Netherlands 3,248; West Germany 246. |
| Limestone (except dimension) do | 541 | 532 | Netherlands 343; France 186. |
| Quartz and quartzite ----- do | 7 | 10 | Mainly to West Germany. |
| Sand, excluding metal bearing do | 2,826 | 3,229 | France 895; Italy 494; Netherlands 468. |
| Sulfur: | | | |
| Elemental, all forms | 8,991 | 21,391 | France 7,198; West Germany 4,932; Netherlands 3,569. |
| Sulfur dioxide | 237 | 46 | NA. |
| Sulfuric acid | 191,469 | 201,190 | France 127,854; West Germany 40,892; Netherlands 7,145. |
| Talc, steatite, soapstone, pyrophyllite | 14,445 | 17,538 | West Germany 4,134; Sweden 2,934; United Kingdom 2,524. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Meerschaum, amber, jet ------ | 1,665 | 598 | West Germany 330; Switzerland 15. |
| Lithium minerals | 5,288 | 7,992 | Mainly to Netherlands. |
| Vermiculite, perlite, chlorite -- | 132 | 139 | NA. |
| Other ------- thousand tons | 1,513 | 1,521 | Mainly to Netherlands. |
| Slag, dross, and similar waste, not metal bearing ------ do | 3,232 | 2,903 | France 1,119; Netherlands 1,088; West Germany 673. |
| Oxides and hydroxides of magnesium strontium, barium ------ | 1,253 | 744 | NA. |
| Halogens | 13 | 20 | Greece 5; Israel 5; Italy 4. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 4,646 | 19,339 | Mainly to Netherlands. |
| Carbon black and gas carbon: | | | |
| Carbon black | 17,979 | 22,828 | Mainly to West Germany. |
| Gas carbon | 1,123 | 58 | NA. |
| Coal and briquets: | | | |
| Anthracite and bituminous coal thousand tons | 661 | 591 | West Germany 340; France 214; Netherlands 13. |
| Briquets of anthracite and bituminous coal -------- do | 90 | 55 | France 32; West Germany 13. |
| Lignite and lignite briquets ------ | 50 | 36 | NA. |
| Coke and semicoke -- thousand tons | r 422 | 456 | France 149; West Germany 130; Sweden 57. |
| Gas, natural -----million cubic feet | 60 | 4 | NA. |

See footnotes at end of table.

## Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIAL—Continued | | | |
| Hydrogen, argon, other rare gases | 6,943 | 13,799 | France 5,778; Netherlands 2,000; West Germany 1,996. |
| Peat, including peat briquets and litter | 1,278 | 902 | Brazil 80. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 113 | 2,216 | Mainly to West Germany. |
| Refinery products: | | | |
| Gasoline do | r 23,831 | 27,254 | United Kingdom 7,557; Netherlands 6,535; West Germany 4,870. |
| Kerosine do | r 5,574 | 4,783 | United Kingdom 1,899; Norway 585; West Germany 566. |
| Distillate fuel oil do | r 26,336 | 30,581 | West Germany 8,014; Sweden 6,538; United Kingdom 6,384. |
| Residual fuel oil do | r 37,016 | 39,966 | Sweden 8,654; United Kingdom 4,946; West Germany 4,878. |
| Lubricants do | r 2,169 | 2,281 | Netherlands 716; West Germany 215; Switzerland 152. |
| Other: | | | |
| Liquefied petroleum gas do | 1,871 | 1,550 | United Kingdom 222; France 207; Portugal 184. |
| White spirits do | 1,174 | 945 | West Germany 426; Netherlands 182; Sweden 108. |
| Mineral jelly and wax do | 10 | 14 | Spain 3; France 2; Netherlands 1. |
| Nonlubricating oils, n.e.s do | 46 | 25 | Saudi Arabia 7; Lebanon 6; West Germany 2. |
| Bitumen and other residues do | 2,916 | 3,261 | Netherlands 1,095; United Kingdom 837; West Germany 716. |
| Bituminous mixtures, n.e.s do | 60 | 68 | Netherlands 46; France 9; West Germany 3. |
| Pitch, pitch coke, petroleum coke do | 171 | 192 | France 135; Norway 32; Netherlands 23. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons | r 171 | 224 | West Germany 78; Netherlands 53; France 30. |

r Revised. NA Not available.
[1] Figure does not contain thorium in 1973.
[2] May include diamond.

## Table 3.—Belgium-Luxembourg: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 17,019 | 14,961 | Guyana 8,215; West Germany 2,835; Netherlands 1,492. |
| Oxide and hydroxide | 14,487 | 16,256 | West Germany 13,981; France 993. |
| Ash and residue containing aluminum | 1,520 | 3,090 | United Kingdom 1,479; West Germany 761; France 302. |
| Metal including alloys: | | | |
| Scrap | 12,997 | 18,810 | Netherlands 10,011; France 4,026; Hungary 687. |
| Unwrought | 209,232 | 234,740 | Netherlands 77,273; Norway 44,307; France 32,313. |
| Semimanufactures | 48,076 | 60,939 | West Germany 24,402; Netherlands 17,893; France 10,066. |
| Antimony: | | | |
| Ore and concentrate | 8,459 | 12,024 | Bolivia 5,001; Canada 2,155; Morocco 1,259. |
| Metal including alloys, all forms | 50 | 352 | People's Republic of China 229; West Germany 100. |
| Arsenic: | | | |
| Natural sulfides | -- | 24 | NA. |
| Trioxide, pentoxide, acids | 316 | 252 | NA. |
| Beryllium metal including alloys, all forms kilograms | 2,100 | 800 | NA. |

See footnotes at end of table.

## Table 3.—Belgium-Luxembourg: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Bismuth metal including alloys, all forms | 382 | 485 | Mainly from Bolivia. |
| Cadmium metal including alloys, all forms | 1,070 | 1,259 | West Germany 364; Japan 320; U.S.S.R. 295. |
| Chromium: | | | |
| Chromite | 3,032 | 3,170 | Philippines 993; Netherlands 820; Mozambique 534. |
| Oxide and hydroxide | r 550 | 778 | West Germany 547; France 156. |
| Metal including alloys, all forms | 78 | 118 | West Germany 62; France 27; United Kingdom 20. |
| Cobalt oxides and hydroxides kilograms | 12,800 | 10,500 | Mainly from France. |
| Copper: | | | |
| Ore and concentrate | 25,447 | 30,990 | Canada 7,222; Morocco 6,007; Australia 5,876. |
| Matte | 197,329 | 223,682 | Zaire 137,152; Republic of South Africa 47,165. |
| Copper sulfate | 716 | 783 | France 505; U.S.S.R. 191. |
| Ash and residue containing copper | 12,075 | 28,224 | France 13,089; United States 8,569; Spain 2,439. |
| Metal including alloys: | | | |
| Unwrought | r 253,355 | 308,865 | Zaire 143,483; West Germany 31,614; France 24,971. |
| Semimanufactures | 17,632 | 22,913 | West Germany 11,610; France 4,611; Netherlands 3,534. |
| Germanium metal including alloys, all forms | 6 | 16 | Netherlands 11; Italy 4; Hungary 1. |
| Gold: | | | |
| Waste and sweepings value thousands | $479 | $1,207 | Mainly from the United States. |
| Metal, unworked and partly worked thousand troy ounces | r 789 | 956 | Switzerland 508; West Germany 153; United Kingdom 50. |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite thousand tons | 28,078 | 32,417 | France 14,215; Sweden 8,689; Norway 1,124. |
| Roasted pyrite do | 135 | 568 | France 430; West Germany 125. |
| Metal: | | | |
| Scrap do | r 827 | 698 | France 307; Netherlands 117; West Germany 113. |
| Pig iron, including cast iron do | 159 | 234 | West Germany 106; France 73; East Germany 31. |
| Sponge iron, powder, shot do | 5 | 7 | France 2; West Germany 2; Sweden 1. |
| Spiegeleisen do | 1 | (1) | Mainly from West Germany. |
| Ferroalloys do | 164 | 202 | France 73; Norway 39; West Germany 28. |
| Steel, primary forms do | 1,057 | 1,225 | Netherlands 422; West Germany 208; France 203. |
| Semimanufactures: | | | |
| Bars, rods, angles shapes, sections do | 586 | 764 | France 299; West Germany 178; Netherlands 90. |
| Universals, plates, sheets do | 596 | 669 | West Germany 154; Netherlands 124; France 112. |
| Hoop and strip do | 89 | 127 | France 80; West Germany 22; Netherlands 13. |
| Rails and accessories do | 8 | 7 | France 2; Netherlands 1; West Germany 1. |
| Wire do | 29 | 45 | West Germany 22; France 16; Netherlands 4. |
| Tubes, pipes, fittings do | 190 | 166 | West Germany 59; Netherlands 51; France 40. |
| Castings and forgings, rough do | 12 | 15 | France 4; West Germany 4; Netherlands 3. |
| Lead: | | | |
| Ore and concentrate | 113,813 | 105,161 | Ireland 30,035; Peru 15,849; Morocco 13,412. |
| Ash and residue containing lead | 40,935 | 57,478 | United States 18,097; France 13,403; United Kingdom 5,318. |
| Oxides | 1,325 | 3,752 | West Germany 2,441; France 554; Netherlands 418. |
| Metal including alloys: | | | |
| Scrap | 12,093 | 12,445 | West Germany 4,935; Netherlands 4,923. |
| Unwrought | 17,497 | 13,614 | France 4,237; Netherlands 2,931; West Germany 2,200. |

See footnotes at end of table.

## Table 3.—Belgium-Luxembourg: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Lead—Continued | | | |
| Metal including alloys—Continued | | | |
| Semimanufactures | 1,691 | 1,631 | Netherlands 590; West Germany 472; France 299. |
| Magnesium metal including alloys: | | | |
| Scrap | 160 | 111 | NA. |
| Unwrought | 1,313 | 1,319 | Italy 352; United States 329; Netherlands 294. |
| Semimanufactures | 151 | 95 | West Germany 54; United States 22; Switzerland 7. |
| Manganese: | | | |
| Ore and concentrate | 356,520 | 423,991 | Republic of South Africa 228,701; Angola 44,455; Zaire 34,123. |
| Oxides | 922 | 1,646 | Japan 1,185; Netherlands 74. |
| Metal | 564 | 884 | Republic of South Africa 258; United States 142; Japan 96. |
| Mercury 76-pound flasks | 6,040 | 2,300 | Algeria 592; Netherlands 519; Italy 412. |
| Molybdenum: | | | |
| Ore and concentrate | 9,542 | 10,987 | Canada 8,009; Peru 364. |
| Metal including alloys, all forms | 18 | 231 | Mainly from Netherlands. |
| Nickel: | | | |
| Matte, speiss, similar materials | 56 | 73 | Canada 30; United Kingdom 20; United States 10. |
| Metal including alloys: | | | |
| Scrap | 1,504 | 1,611 | France 308; United States 228; West Germany 217. |
| Unwrought | 2,555 | 2,797 | United Kingdom 867; Netherlands 787; Republic of South Africa 359. |
| Semimanufactures | 1,662 | 1,850 | West Germany 835; United Kingdom 509; France 161. |
| Platinum-group metals including alloys, all forms troy ounces | r 115,881 | 108,695 | France 43,445; Brazil 22,396; United Kingdom 21,817. |
| Selenium, elemental kilograms | 5,500 | 19,600 | Netherlands 8,600; West Germany 7,000; United States 1,200. |
| Silver metal including alloys thousand troy ounces | r 14,929 | 11,105 | Netherlands 5,985; West Germany 1,352; United Kingdom 1,244. |
| Thorium ore and concentrate kilograms | -- | 94,000 | All from Peru. |
| Tin: | | | |
| Ore and concentrate long tons | 6,113 | 5,598 | Zaire 3,256; Rwanda 1,870. |
| Oxides do | 14 | 48 | Japan 27; West Germany 17; Italy 4. |
| Metal including alloys: | | | |
| Scrap do | 85 | 74 | West Germany 21; Ireland 15; Netherlands 9. |
| Unwrought do | 1,692 | 1,543 | Zaire 1,005; Netherlands 256; United Kingdom 33. |
| Semimanufactures do | 199 | 276 | Netherlands 151; West Germany 70; United Kingdom 20. |
| Titanium: | | | |
| Ore and concentrate | 69,247 | 70,936 | Mainly from Canada. |
| Oxides | 11,360 | 13,082 | West Germany 6,254; Netherlands 4,210. |
| Metal including alloys, all forms | 454 | 967 | United States 634; U.S.S.R. 239; Canada 34. |
| Tungsten: | | | |
| Ore and concentrate | 265 | 418 | People's Republic of China 220; Zaire 136. |
| Metal including alloys, all forms | 28 | 246 | Netherlands 226; France 8; West Germany 4. |
| Uranium: | | | |
| Ore and concentrate kilograms | -- | 100,800 | NA. |
| Metal including alloys, all forms do | 1,945 | 5,778 | United Kingdom 4,643; West Germany 982; United States 149. |
| Zinc: | | | |
| Ore and concentrate | 554,571 | 636,923 | Canada 423,092; West Germany 40,505; Peru 27,300. |
| Oxide and peroxide | 7,812 | 10,455 | France 3,622; Netherlands 2,499; United States 1,847. |
| Ash and residue containing zinc | 51,006 | 54,812 | West Germany 23,591; France 6,591; United Kingdom 4,734. |
| Metal including alloys: | | | |
| Scrap | 1,812 | 4,293 | West Germany 1,583; United States 979; Netherlands 873. |
| Blue powder | 385 | 1,321 | Mainly from West Germany. |
| Unwrought | 39,295 | 67,021 | Zaire 16,502; North Korea 16,470; U.S.S.R. 9,820. |
| Semimanufactures | 8,092 | 10,355 | France 8,792; West Germany 151; Netherlands 128. |

See footnotes at end of table.

## Table 3.—Belgium-Luxembourg: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Other: | | | |
| Ore and concentrate: | | | |
| Of columbium, tantalum, vanadium, and zirconium | 3,348 | 3,940 | Australia 1,530; West Germany 571; United States 367. |
| Of precious metals kilograms | 34,100 | 351,200 | Turkey 300,000. |
| Of base metals, not elsewhere specified | 2,633 | 3,453 | Australia 1,481; Zaire 753; Bolivia 491. |
| Ash and residue containing nonferrous metals, n.e.s | 110,926 | 74,838 | West Germany 68,286; France 1,955; Hungary 904. |
| Waste and sweepings of precious metals value thousands | r $1,411 | $8,871 | United States $4,115; France $2,594; Switzerland $1,471. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | 3,024 | 3,474 | West Germany 1,689; Netherlands 533; Mozambique 348. |
| Metals including alloys, all forms: | | | |
| Metalloids: | | | |
| Tellurium and arsenic | 93 | 73 | Sweden 59; United States 8; U.S.S.R. 3. |
| Other | 654 | 798 | France 327; West Germany 192; Norway 139. |
| Alkali, alkaline earth, rare-earth metals | 239 | 145 | France 53; West Germany 36; Brazil 20. |
| Pyrophoric alloys | 23 | 48 | Austria 45; United Kingdom 1; France 1. |
| Base metals including alloys, all forms, n.e.s | 12,877 | 20,045 | United States 57; West Germany 19; France 1. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 134,843 | 126,956 | West Germany 90,940; Netherlands 148; France 67. |
| Dust and powder of precious and semiprecious stones, natural and manufactured, including diamond kilograms | 1,045 | 1,710 | United States 800; Ireland 408; United Kingdom 174. |
| Grinding and polishing wheels and stones | 2,505 | 2,760 | West Germany 754; France 486; Italy 461. |
| Asbestos | 89,865 | 85,615 | Canada 45,365; Republic of South Africa 12,395; West Germany 10,084. |
| Barite and witherite | 8,375 | 14,546 | Netherlands 6,741; France 5,867; West Germany 886. |
| Boron materials: | | | |
| Crude natural borates | 48,381 | 58,555 | Netherlands 44,177; Turkey 9,888; West Germany 1,311. |
| Oxide and acid | 2,959 | 4,076 | Turkey 2,295; France 1,191. |
| Bromine kilograms | r 301,900 | 21,100 | NA. |
| Cement | 98,614 | 78,499 | France 29,617; Netherlands 28,812; West Germany 12,180. |
| Chalk | 90,103 | 114,125 | France 75,665. |
| Clays and clay products: | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 13,810 | 11,315 | West Germany 4,597; Italy 4,104; Netherlands 947. |
| Kaolin | 229,540 | 277,598 | United Kingdom 103,352; West Germany 98,311; Netherlands 51,694. |
| Other | 260,306 | 259,858 | West Germany 142,155; Netherlands 42,279; France 37,216. |
| Products: | | | |
| Refractory (including nonclay brick) | 122,587 | 155,762 | West Germany 87,296; Austria 18,333; France 12,795. |
| Nonrefractory value, thousands | $30,301 | $48,198 | West Germany $15,391; Italy $9,751, Netherlands $6,680. |
| Cryolite and chiolite | 357 | 147 | All from Denmark. |
| Diamond (except powder): | | | |
| Gem: | | | |
| Unworked thousand carats | 12,038 | 13,863 | Mainly from United Kingdom. |
| Worked do | 901 | 1,139 | India 253; Israel 190; Republic of South Africa 135. |

See footnotes at end of table.

## Table 3.—Belgium-Luxembourg: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Diamond (except powder)—Continued | | | |
| Industrial: | | | |
| Unworked ---------- do ---- | 8,290 | 6,654 | United States 1,830; United Kingdom 1,702; Ireland 1,031. |
| Worked ---------- do ---- | 5 | 6 | United Kingdom 3; Switzerland 1; Poland 1. |
| Diatomite and other infusorial earth -- | 5,883 | 6,599 | France 2,578; Denmark 1,639; United States 1,098. |
| Feldspar, leucite, nepheline, nepheline syenite ---------- | 52,499 | 72,562 | Norway 44,541; France 20,152; West Germany 3,368. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous ---------- | r 13,886 | 18,366 | Mainly from Chile. |
| Phosphatic -- thousand tons -- | 2,194 | 2,287 | Morocco 1,403; United States 295; U.S.S.R. 24. |
| Potassic ---------- | (2) | (2) | NA. |
| Manufactured: | | | |
| Nitrogenous, $N_2$ content ------ | 59,594 | 107,216 | West Germany 50,479; France 26,672; United States 8,223. |
| Phosphatic, $P_2O_5$ content ------ | 13,525 | 8,867 | Tunisia 3,536; United Kingdom 1,886; Netherlands 1,853. |
| Potassic ---------- | (2) | (2) | NA. |
| Other, including mixed -------- | 110,315 | 128,053 | France 80,485; West Germany 24,884; Colombia 5,306. |
| Ammonia ---------- | 308,483 | 2,667 | West Germany 1,532; France 925. |
| Fluorspar ---------- | 12,331 | 12,779 | France 6,761; West Germany 2,799; East Germany 1,720. |
| Graphite, natural ---------- | 1,167 | 5,518 | United States 4,813; France 244; West Germany 209. |
| Gypsum and plasters ---------- | 482,339 | 476,052 | Mainly from France. |
| Lime ---------- | 218,774 | 187,536 | France 162,789; West Germany 2,686. |
| Magnesite ---------- | 14,268 | 22,723 | Greece 4,807; Brazil 4,585; West Germany 3,542. |
| Mica: | | | |
| Crude, including splittings and waste ---------- | 2,064 | 3,397 | India 1,866; Malagasy Republic 510; Norway 264. |
| Worked, including agglomerated splittings ---------- | 71 | 60 | United Kingdom 13; France 10; East Germany 10. |
| Pigments, mineral, including processed iron oxides ---------- | 7,724 | 8,375 | Mainly from West Germany. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural: | | | |
| Unworked ------ kilograms -- | 10,480 | 10,923 | Mainly from Zaire. |
| Worked: | | | |
| Gem ---------- do ---- | 1,358 | 1,838 | Hong Kong 456; Netherlands 99; France 89. |
| Industrial -------- do ---- | 337 | 218 | Mainly form United States. |
| Manufactured ---------- do ---- | 5,119 | 4,763 | Do. |
| Pyrite (gross weight) ---------- | 218,513 | 247,829 | Spain 170,646; Portugal 76,982. |
| Salt and brine ------ thousand tons -- | 1,470 | 866 | West Germany 491; Netherlands 342; France 12. |
| Sodium and potassium compounds, n.e.s ---------- | r 32,357 | 29,008 | Netherlands 17,391; West Germany 4,427; Sweden 1,410. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked ----- | 198,015 | 191,784 | France 88,202; Portugal 17,672; Italy 15,480. |
| Worked ---------- | r 38,033 | 45,441 | Italy 15,148; France 9,947; Portugal 4,636. |
| Dolomite, chiefly refractory grade - | 49,467 | 50,052 | France 32,679; West Germany 10,116. |
| Gravel and crushed rock thousand tons -- | 5,873 | 5,313 | Netherlands 3,596; West Germany 508; United Kingdom 448. |
| Limestone (except dimension) ---- | 173,136 | 18,928 | United Kingdom 12,583. |
| Quartz and quartzite ---------- | 124,025 | 108,555 | West Germany 66,780; France 22,478; Norway 6,119. |
| Sand, excluding metal bearing thousand tons -- | 9,507 | 8,577 | Netherlands 7,816; France 303; West Germany 28. |
| Sulfur: | | | |
| Elemental, all forms ---------- | 610,082 | 673,779 | United States 465,570; Netherlands 80,962; West Germany 1,082. |
| Sulfur dioxide ---------- | 3,311 | 3,855 | Mainly from West Germany. |
| Sulfuric acid ---------- | 63,798 | 151,047 | West Germany 85,396; Netherlands 33,575; Poland 13,251. |

See footnotes at end of table.

## Table 3.—Belgium-Luxembourg: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Talc, steatite, soapstone, pyrophyllite | 28,089 | 58,491 | United States 38,157; France 4,187. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Lithium minerals | 6,079 | 7,419 | Mainly from Mozambique. |
| Vermiculite, perlite, chlorite | 31,246 | 29,527 | Mainly from People's Republic of China. |
| Other | 76,015 | 132,429 | Netherlands 48,450; West Germany 33,780; Spain 21,723. |
| Slag, dross, and similar waste, not metal bearing | 255,323 | 222,133 | West Germany 29,766; France 24,445; Netherlands 22,617. |
| Oxides and hydroxides of magnesium, strontium, barium | 2,529 | 2,142 | West Germany 705; United States 288; France 251. |
| Halogens (other than chlorine and bromine) | 117 | 135 | Mainly from Chile. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 8,325 | 8,004 | Mainly from Netherlands. |
| Carbon black and gas carbon: | | | |
| Carbon black | 27,480 | 31,295 | West Germany 12,235; Netherlands 11,681; France 2,280. |
| Gas carbon | 1,652 | 1,654 | Mainly from West Germany. |
| Coal and briquets: | | | |
| Anthracite and bituminous coal thousand tons | 6,285 | 7,488 | West Germany 3,315; Poland 1,403; United States 1,133. |
| Briquets of anthracite and bituminous coal do | 203 | 147 | Mainly from Netherlands. |
| Lignite and lignite briquets do | 82 | 74 | Mainly from West Germany. |
| Coke and semicoke do | 4,164 | 4,253 | Do. |
| Gas, natural million cubic feet | 292,150 | 342,711 | Mainly from Netherlands. |
| Hydrogen, argon, rare gases | 6,347 | 8,112 | Netherlands 4,504; West Germany 3,336; United States 192. |
| Peat, including peat briquets and litter | 60,873 | 88,716 | Netherlands 45,888; West Germany 41,581; Finland 24. |
| Petroleum: | | | |
| Crude and partly refined: | | | |
| Crude thousand 42-gallon barrels | 317,794 | 264,519 | Saudi Arabia 113,057; Iran 47,988; Libya 29,385. |
| Partly refined do | 7,111 | 4,466 | U.S.S.R. 1,641; West Germany 492; Spain 382. |
| Refinery products: | | | |
| Gasoline do | r 6,934 | 7,296 | Netherlands 3,998; France 1,057; West Germany 1,027. |
| Kerosine do | r 392 | 931 | Italy 353; U.S.S.R. 289; Netherlands 280. |
| Distillate fuel oil do | r 15,133 | 16,059 | Netherlands 7,419; France 3,268; U.S.S.R. 2,574. |
| Residual fuel oil do | r 22,407 | 24,647 | Netherlands 10,212; Kuwait 6,358; West Germany 2,884. |
| Lubricating oils and grease do | r 3,108 | 3,597 | Netherlands 1,878; United Kingdom 432; United States 410. |
| Other: | | | |
| Liquefied petroleum gas do | 4,085 | 3,782 | Netherlands 3,185; West Germany 233. |
| White spirits do | 87 | 394 | Netherlands 352; France 36. |
| Mineral jelly and wax do | 110 | 132 | West Germany 62; France 28; Netherlands 10. |
| Nonlubricating oils, n.e.s do | 89 | 21 | Mainly from Netherlands. |
| Bitumen and other residues do | 604 | 420 | Netherlands 219; France 175; West Germany 4. |
| Bituminous mixtures, n.e.s do | 257 | 296 | Netherlands 211; France 48; West Germany 20. |
| Pitch, pitch coke, petroleum coke do | 1,164 | 2,591 | Mainly from United States. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | r 97,097 | 81,540 | Netherlands 44,495; France 19,374; West Germany 5,384. |

r Revised. NA Not available.

1 Less than ½ unit.

2 Crude and manufactured potassic fertilizers not reported separately and total of these commodities not reported in terms of gross weight, but rather in terms of $K_2O$ equivalent. Total for 1972 was 535,521 tons $K_2O$ equivalent; total for 1973 606,016 tons $K_2O$ equivalent. Principal sources in 1973 were West Germany, 270,585; France, 136,748; U.S.S.R., 104,737.

## COMMODITY REVIEW

**Metals.**—*Nonferrous.*—Although no new nonferrous metals production facilities were announced during the year, full-capacity production at the new Métallurgie Hoboken-Overpelt S.A./N.V. electrolytic zinc refinery at Overpelt was achieved at midyear, leading to a total nonferrous metal production of approximately 811,000 tons, a 3% increase over the volume in 1973. Demand slackened in the last months of the year, particularly in copper and zinc, so that overall copper production was 404,000 tons, 4% more than 1973 tonnage. Zinc production, at 293,567 tons, represented a 3% increase over the tonnage in 1973.

Production of nonferrous wrought products was at the record level of 571,000 tons, representing a 6% increase over the tonnage produced in 1973 involving principally increases in tonnage of copper and zinc products. Production of precious metals (silver, gold, and the platinum metals) increased 40% over the 1973 level and was the second highest on record.

**Iron and Steel.**—The Belgium steel industry produced a record 16.2 million tons of raw steel in 1974, representing a 4.6% increase over 1973 output. Shipments did not keep pace because slackening export demand developed late in the year and some restocking of inventories occurred. Pig iron and coke production also set new records. Several modernization and expansion programs were underway. S.A. Cockerill-Ougrée-Providence et Espérance-Longdoz (Cockerill) initiated construction of a 2.5-million-ton-per-year Dwight-Lloyd sintering facility at the Liège location to improve burden characteristics and blast furnace productivity. Initial operation was expected in late 1975. S.A. Forges de Thy-Marcinelle et Monceau at its Marcinelle Division started a three-component major project involving (1) the installation of three 150-ton basic oxygen furnaces to replace basic Bessemer furnaces, (2) a six-strand continuous-casting machine for 4⅝ inch-square billets, and (3) provision of top pressure on the largest blast furnace to increase the production rate of pig iron. Total cost was estimated at $84 million with completion in 1976.

S.A. Usine Gustave Boël at La Louvière began construction of a cold reduction mill to convert 300,000 tons per year of hot-rolled coils into cold-rolled sheets and began installation of a continuous-slab-casting machine with a capacity of 500,000 tons per year and slab size to 10 inch thickness and 67 inch width. Cost of the projects was estimated at $45 million with completion late in 1975. Société Mètallurgique Hainaut-Sambre S.A. at Couillet initiated installation of a two-strand slab-casting machine which will increase capacity by 600,000 tons per year to 3 million tons per year and reduce the costs of conversion from molten steel to flat rolled products. Costs were projected at $68 million with completion in 1976.

Société Carlam, a joint venture of Société Mètallurgique Hainaut-Sambre, S.A. and the S.A. des Forges de Chatillon-Commentry-Biache of France, announced that a continuous 80 inch sheet mill was to be constructed at Charleroi. With a capacity of 1 million tons per year, the facility will enable the two parent companies to convert slab products that are now custom rolled by other steel companies. Cost was projected at $105 million with completion in mid-1976.

The Cockerill shipbuilding subsidiary at Hoboken authorized construction of a dry dock to accommodate ships to 300,000 tons. The facility is to be completed by 1976 at a cost of $38 million.

**Nonmetals.**—The nonmetallic minerals industry production index increased to 107.4 overall in 1974 compared with 102.6 in 1973 but declined to levels below corresponding months of 1973 late in the year. Limestone production decreased modestly compared with that of 1973. Sand production for all uses increased 14% compared with that of 1973, whereas dredged gravel production declined. The quantity of marble quarried declined about 10%, whereas the quantity of blue stone (granite) quarried increased slightly compared with that of 1973. Cement production reached a record 7,435,000 tons as new kilns contributed to capacity. Ordinary brick production declined modestly, as did slate for roofing and other products associated principally with housing construction.

The inorganic segment of the chemical industry operated at higher productive levels through October but then fell below the corresponding levels of 1973 during

the last 2 months as export demand declined suddenly. Production of nitric acid increased 5% over that of the record year 1973; sulfuric acid production approximately equaled the volume produced in 1973. Production of fertilizer intermediates and products continued at higher levels in 1974 as new facilities operated at full capacity; production of nitrogen for fertilizers, ammonium sulfate, superphosphate, and processed high-phosphorus Thomas slags increased substantially so that total volume of fertilizer materials approximated 2,598,000 tons, an increase of 6% over the corresponding tonnage in 1973.

**Mineral Fuels.**—Domestic coal production at 8,111,000 tons in 1974 represented an 8% decline compared with that of 1973 as the less efficient coal mines continued to close on a planned long-term schedule. However, productivity per manhour increased substantially during the year. The advent of high fuel oil prices has led to reconsideration of coal policies and a study to determine if the investment required would be justified for an increased level of coal production approximating 10 million tons per year. Coal imports were at the record level of 10,792,000 tons and were required to support increased needs for metallurgical coke production and to provide a higher percentage of fuel requirements for electrical energy production. Imports were principally from West Germany, Poland, and the United States.

The volume of crude petroleum processed during 1974 declined to 30,213,000 tons from 37,005,000 tons in 1973 as conservation measures were applied and price controls on domestic petroleum products reduced refinery throughput substantially in March and April. Gasoline and residual fuel oil production declined 18% from that of 1973, and the fuel oil conserved was replaced by an equivalent increase in coal consumption in the generation of electricity. Total electrical energy generated was 37,731 gigawatt hours, a 5.4% increase compared with that of 1973, whereas the increase from 1972 to 1973 was 9.4%. Fuels for electrical energy generation involved coal (18%), petroleum products (48%), natural gas (25%), and manufactured gas (9%). The percentage of energy generated from petroleum products declined 5% compared with that of 1973, and coal consumption increased an equivalent amount.

The first nuclear powerstation in Belgium (a pressurized water reactor of 393 megawatts) came on line in 1974; the second of the dual units at Doel will become operational at the end of 1975. A larger 870-megawatt unit at Tihange was scheduled to go into operation also in 1975. The overall plan for the period 1976–83 is to produce 25% of baseline electrical energy requirements from nuclear steam generators in 1980 and 50% in 1983.

The petrochemical industry continued its rapid growth as shown by the relative tonnage of primary materials consumed in the production plastics. The estimated figure of 407,000 tons for 1974 represents a 7% increase over the 380,000 tons consumed in 1973.

Total value of petroleum, petrochemical, and inorganic chemical projects planned in Belgium increased in 1974 compared with that of 1973. The number of projects has also increased to 91 valued at $1,500 million versus 68 in 1973 valued at $1,180 million. However, the value of projects actually contracted or under construction declined. The largest single project is the catalytic cracker and downstream facilities of Chevron Oil Belgium at Feluy. The Antwerp and Hainaut areas account for most of the facility expansions in value and number of projects.

## LUXEMBOURG

The steel industry, which dominates the industrial economy of Luxembourg, operated at record levels in 1974; total raw steel production of 6.45 million tons represented a 8.8% increase over the total for 1973. Over 90% was exported, and although export demand declined substantially late in the year, production continued at a high level to replenish depleted inventories of semifinished products. Pig iron production was also at a record level of 5.5 million tons, representing a 7.5% increase over the 1973 tonnage. Iron ore production in South Luxembourg totaled 2.7 million tons (a decline from the 3.8 million tons in 1973)

with the balance imported by Aciériés Réunies de Burback-Eich-Dudelange S.A. (ARBED) from captive mines in France, and from Sweden and Brazil.

ARBED announced two capital projects during the year, both of which will increase steelmaking capacity. Completion is scheduled for 1976. The single basic oxygen vessel at Esch-Schifflange will be replaced by an interchangeable device permitting alternate use of two vessels in one position, thereby increasing capacity from 420,000 to 700,000 tons per year. Cost was estimated at $9.5 million. The second project, at the Esch-Belval plant, involves replacing the original two basic oxygen vessels by larger, 150-ton units, thereby increasing plant capacity by 250,000 tons per year. The cost of the project, including improved heat recovery units in the hoods of the oxygen furnaces, was estimated at $14 million. A new 5-year plan for further expansion and modernization is under consideration by ARBED for 1976–80 but details have not been announced.

In 1973 about 75% of the steel tonnage was exported to countries of the EC with West Germany receiving 25%, Belgium 15%, France 15%, and the Netherlands 7% of the product.

**Table 4.—Luxembourg: Production of mineral commodities**
(Thousand metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| METALS | | | |
| Iron ore and concentrate | 4,116 | 3,782 | 2,686 |
| Pig iron (including blast furnace ferroalloys) | 4,671 | 5,089 | 5,468 |
| Steel: | | | |
| Crude | 5,457 | 5,924 | 6,448 |
| Semimanufactures | 4,302 | 4,706 | 4,986 |
| NONMETALS | | | |
| Cement, hydraulic | 309 | 357 | 391 |
| Fertilizers, manufactured, phosphatic, Thomas slag, gross weight | 908 | 859 | 1,036 |
| Gypsum and anhydrite, crude metric tons | 4,890 | [r e] 4,200 | 3,570 |
| Quartz, quartzite, glass sand do | 36,825 | 23,928 | 31,920 |
| Stone, sand and gravel, n.e.s.: | | | |
| Sand: | | | |
| Molding | 5 | 25 | 4 |
| Other, industrial | 612 | 860 | 866 |
| Stone: | | | |
| Building stone: | | | |
| Rough cut thousand cubic meters | 15 | 6 | 11 |
| Facing thousand square meters | 1 | NA | 1 |
| Cut stone, crude cubic meters | 195 | 314 | 35 |
| Crushed stone | 566 | 265 | 475 |
| Dolomite, n.e.s | 129 | 454 | 494 |
| Paving blocks thousand pieces | 51 | 18 | 13 |
| Slate slabs thousand square meters | 13 | 12 | 10 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Manufactured gas million cubic feet | 90,370 | 94,491 | [e] 96,000 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to the commodities listed, Luxembourg also produces refractory clays and manufactured phosphatic fertilizers other than Thomas slag, but data are not published and information is inadequate to make reliable estimates of output levels.

# The Mineral Industry of Bolivia

By V. Anthony Cammarota, Jr.[1]

The mineral industry provided 53%, and petroleum and natural gas provided 37% of the total value of Bolivia's exports. High metal prices during most of 1974 enabled Bolivia to reach an f.o.b. value of $266 million[2] for its mineral exports. Corporación Minera de Bolivia (COMIBOL), after taxes and other allowances, made a profit of $5.2 million, compared with $9.3 million in 1973. Costs of labor, materials, and equipment, increased significantly. The private mining sector was similarly affected, especially in the matter of high mineral export taxes.

The Bolivian mining industry employed about 45,000 permanent workers and about 10,000 seasonal workers. COMIBOL was the largest employer with 24,000 workers, followed by the Medium Miners Association with 7,000, and the Small Miners Association and cooperative organizations with 14,000. COMIBOL derives its mineral output from its own mines, from leases of small mining properties, from purchases from cooperatives and small private owners, and from the volatilization of low-grade tin concentrate.

The Medium Miners Association increased from 23 companies in 1973 to 28 companies in 1974. While these companies produce 10 commodities, the only significant increase in production in 1974 was a 36% increase in zinc production. The Medium Miners cited heavy export taxes and the special tax on mineral exports to prevent windfall profits as the reasons for lower production. Increases in mining, transportation, and smelting costs contributed to cutbacks in development. A Medium Miners company is one that has paid-in capital of at least $100,000, and produces a minimum of 5.5 tons of fine tin in concentrate, or 20 tons of antimony or zinc, or 15 tons of copper or lead.

The Small Miners Association, which is obliged by law to sell its mineral production to Banco Minero de Bolivia (BAMIN), increased production by 103% over that of 1973. About 2,000 producers sell to BAMIN. These miners also experienced higher costs during the year, and would be more adversely affected because BAMIN deducts from its purchase price the higher smelting and transportation costs for the lower grade material from the Small Miners. In addition, there were about 120 unclassified mines which must sell their production to BAMIN unless authorized to sell directly to foreign buyers.

The Comisión Boliviana de Energía Nuclear (COBOEN) and the Ministry of Mines signed a contract with the Italian firm AGIP, S.p.A., to explore for uranium in Corocoro, Lípez, Tarija, and San José of Chiquitos.

Servicio Geológico de Bolivia (GEOBOL), the agency that gathers data from the Earth Resources Technical Satellite, mapped favorable mineral exploration areas in Bolivia. A U.S. Geological Survey mission was contracted to advise GEOBOL on its program.

A list of the more important Supreme Decrees (S.D.) passed in 1974 affecting the mining and smelting industries follows:

S.D. 11571, July 2, 1974: Created the Institute of Geologic, Mining, and Metallurgical Investigations (GEOMIN) as a state entity by combining GEOBOL, the Instituto de Investigaciones Minero-Metalúrgicas (IIMM), and the Departmento de Materias Primas, Comisión Boliviana de Energía Nuclear (COBOEN). GEOMIN will act as advisor and give technical

[1] Physical scientist, Division of Nonferrous Metals.

[2] Where necessary, values have been converted from peso Boliviana ($b) to U.S. dollars at the official exchange rate of 20$b = US$1.00.

assistance to the mining industry.

S.D. 11641, July 11, 1974: Authorized COMIBOL to sign a contract with the U.S.S.R. for the construction of a tin volatilization plant in Oruro.

S.D. 12087, December 27, 1974: Authorized Empresa Nacional de Fundiciones (ENAF), the national smelting company, to ask for bids from foreign countries to design a zinc refinery including a sulfuric acid recovery plant.

## PRODUCTION

Of the 12 metals mined in Bolivia in 1974, arsenic, bismuth, gold, and tungsten showed increases. Mine output of tin was down 2%. Of the nonmetals, production of crude gypsum increased 132%, but elemental sulfur production fell 26%. Gross natural gas production fell 5% because of a pipeline disruption, while crude oil production fell 4% because of a lack of export markets at a price acceptable to the Government, and technical and equipment supply problems in the oilfields.

## Table 1.—Bolivia: Production of mineral commodities

(Metric tons unles otnerwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| **METALS [2]** | | | | |
| Antimony: | | | | |
| Mine output, metal content | | 13,338 | 14,933 | 13,060 |
| Metal [3] | | NA | 21 | -- |
| Arsenic, mine output, white arsenic equivalent | | -- | -- | 11 |
| Bismuth: | | | | |
| Mine output, metal content | | 587 | 588 | 613 |
| Metal [3] | | 439 | 500 | 575 |
| Cadmium, mine output, metal content [4] | | 139 | 169 | 135 |
| Copper, mine output, metal content | | 8,307 | 8,555 | 8,130 |
| Gold, mine output, metal content [5] | troy ounces | [r] 20,058 | 36,349 | 43,272 |
| Iron ore: | | | | |
| Gross weight | | [r6] 1,633 | [6] 16,582 | -- |
| Metal content | | [r6] 1,021 | [6] 10,364 | -- |
| Lead: | | | | |
| Mine output, metal content | | 20,504 | 20,995 | 17,449 |
| Metal, including alloys [3] | | [r] 140 | 50 | 21 |
| Manganese ore, gross weight | | 93 | 643 | 513 |
| Silver, mine output, metal content | thousand troy ounces | 5,581 | 5,803 | 5,385 |
| Tin: | | | | |
| Mine output, metal content [7] | long tons | 30,986 | 29,741 | 29,032 |
| Metal including alloys [3] | do | [r] 6,300 | 6,757 | 6,938 |
| Tungsten, mine output, metal content | | [r] 1,948 | 2,184 | 2,821 |
| Zinc, mine output, metal content | | 42,068 | 51,744 | 48,221 |
| **NONMETALS** | | | | |
| Barite [3] | | -- | -- | -- |
| Cement, hydraulic [8] | | 150,881 | 165,638 | 202,298 |
| Fluorspar [3] | | 17 | -- | -- |
| Gypsum, crude [3] | | 2,308 | 1,400 | 3,251 |
| Stone: | | | | |
| Calcite [3] | | 32 | 105 | 83 |
| Quartz [3] | | 750 | -- | -- |
| Sulfur, elemental [3] | | 18,214 | 56,393 | 41,769 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | |
| Gas, natural: | | | | |
| Gross production | million cubic feet | 120,965 | 151,199 | 144,128 |
| Marketable production | do | [r] 37,203 | 57,857 | 60,539 |
| Natural gas liquids: | | | | |
| Natural gasoline | thousand 42-gallon barrels | 67 | 76 | 78 |
| Liquefied petroleum gas | do | 51 | 48 | 65 |
| Petroleum: | | | | |
| Crude | do | 15,967 | 17,266 | 16,603 |
| Refinery products: | | | | |
| Gasoline | do | 2,107 | 2,272 | 2,332 |
| Jet fuel | do | [r] 128 | 148 | 227 |
| Kerosine | do | 923 | 990 | 919 |
| Distillate fuel oil | do | 756 | 849 | 919 |
| Residual fuel oil | do | 1,091 | 1,041 | 1,124 |
| Lubricants | do | [r] 60 | 58 | 68 |
| Other: | | | | |
| Liquefied petroleum gas | do | 70 | 94 | 125 |
| Unspecified | do | ([9]) | 1 | 2 |
| Refinery fuel and losses | do | [r] 75 | 80 | 216 |
| Total | do | [r] 5,210 | 5,533 | 5,932 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, salt and a variety of construction materials such as clays, stone, sand, and gravel are produced, but information is inadequate to permit formulation of reliable estimates of output levels.

[2] Unless otherwise specified, data shown represent the sum of production by COMIBOL and exports by medium and small mines.

[3] Total national exports.

[4] Contained in zinc concentrates produced by COMIBOL.

[5] Includes COMIBOL output, and sales by placer mines. (Medium and small mines cannot legally export gold.)

[6] Total national exports excluding approximately 50,000 metric tons (gross weight) containing about 32,000 metric tons of iron that was exported from the Mutún deposit during 1972 and 1973.

[7] Sum of COMIBOL production; COMIBOL purchases from lessees in COMIBOL-owned mines and from other producers; sales of medium and small mines to ENAF and exports of medium and small mines.

[8] Sales by cement plants.

[9] Less than ½ unit.

## TRADE

Preliminary figures indicated an export value of $266 million f.o.b. for minerals, and $188 million for petroleum and natural gas in 1974. This represents an increase of $112 million from 1973 figures for minerals and $121 million for petroleum and natural gas. High metal and petroleum prices were responsible for the gain.

In 1974, the private mining sector exported minerals valued c.i.f. at approximately $190 million, up $79 million from the $111 million in 1973. COMIBOL's exports amounted to $196 million, up $82 million from the $114 million in 1973.

The value of all exported mineral commodities except manganese increased in 1974, although the amounts of zinc, antimony, copper, tungsten, lead, manganese, sulfur, and calcite declined. In addition, arsenic, barite, and marble were exported in 1974. Tin accounted for 60% of the total mineral export value in 1974, compared with 58% in 1973. The tin portion of the total export market decreased to 31% from 39% in 1973.

The relation of mineral trade to total trade for 1972–74 were as follows in million dollars:

| | Mineral commodity trade | Total commodity trade |
|---|---|---|
| Exports (f.o.b.): | | |
| 1972 | 146 | e 203 |
| 1973 | 154 | 268 |
| 1974 p | 266 | 504 |
| Imports (f.o.b.): | | |
| 1972 | NA | r 193 |
| 1973 | NA | 246 |
| 1974 | NA | e 349 |

e Estimate. p Preliminary. r Revised.
NA Not available.

**Table 2.—Bolivia: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS [1] | | | |
| Antimony: | | | |
| In ore and concentrate | 13,149 | 14,779 | United States 9,108; Switzerland 5,368. |
| As metal and in alloys | -- | 21 | |
| Bismuth in ore and concentrate and as metal | 480 | 569 | Belgium 541; Peru 19. |
| Cadmium in zinc ore and concentrate | 51 | 56 | Belgium 55. |
| Copper in ore and concentrate | 8,430 | 8,230 | Japan 6,965; United States 675. |
| Gold metal troy ounces | r 167 | 30 | All to Belgium. |
| Iron in ore and concentrate | 1,021 | 10,364 | All to Argentina. |
| Lead: | | | |
| In ore and concentrate | r 19,048 | 20,152 | United States 9,694; United Kingdom 5,756; Netherlands 2,650. |
| Metal including alloys | 140 | -- | |
| Manganese in ore | 28 | 193 | All to Argentina. |
| Silver in ore and concentrate thousand troy ounces | r 4,605 | 5,281 | United States 2,184; Belgium 1,311; Netherlands 806; United Kingdom 761. |
| Tin: | | | |
| In ore and concentrate long tons | 23,499 | 21,204 | United Kingdom 12,102; United States 6,104. |
| In smelter products do | 6,355 | 6,757 | West Germany 2,464; U.S.S.R. 1,156; Argentina 1,084. |
| Tungsten in ore and concentrate | r 1,730 | 1,742 | United States 1,464; Switzerland 242; Netherlands 36. |
| Zinc in ore and concentrate | 39,702 | 49,568 | United States 33,837; Japan 9,990; Belgium 3,496. |
| NONMETALS | | | |
| Fluorspar | 17 | -- | |
| Gypsum | 2,308 | 1,400 | Japan 600; Brazil 300; Argentina 250; Paraguay 250. |
| Stone: Calcite | 32 | 105 | All to Japan. |
| Sulfur, elemental | 18,214 | 56,393 | All to Chile. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Petroleum, crude thousand 42-gallon barrels | 10,945 | 11,844 | Argentina 5,029; Brazil 2,427; Peru 1,563; Chile 1,374; United States 1,201. |

r Revised.
[1] All data on metal exports are in terms of metal content of material shipped.
Sources: State Department Airgram A-201, La Paz, Oct. 25, 1974, and Telegram 521, La Paz, Jan. 24, 1974.

Table 3.—Bolivia: Exports of tin, by group
(Long tons of contained tin)

| Group | 1972 | 1973 | 1974 p |
|---|---|---|---|
| Tin in concentrates: | | | |
| Corporación Minera de Bolivia (COMIBOL) | 15,587 | 14,368 | 14,733 |
| Medium Miners Association | 4,378 | 4,465 | 3,788 |
| Banco Minero de Bolivia (BAMIN) | 3,437 | 2,370 | 2,788 |
| Smelter products: | | | |
| Refined metal and solder | 6,355 | 6,304 | 6,938 |
| Volatilization products | 98 | 453 | 250 |
| Total | 29,855 | 27,960 | 28,497 |

p Preliminary.

## COMMODITY REVIEW

### METALS

**Gold.**—South American Placers Inc. (SAPI) reverted 10,000 hectares of alluvial gold concessions back to the State. They had been held since 1956 along the Coroico, Challana, Tipuani, Mapiri, and Consata Rivers. SAPI estimated that within 3 years it will have dredged its remaining concessions. The Ministry of Mines planned to establish a national gold policy for exploration and development of gold resources.

**Tin.**—Of the 29,032 long tons of tin-in-concentrate produced in 1974, COMIBOL contributed 19,726 long tons, the Medium Miners 6,439 long tons, and the Small Miners 2,867 long tons. COMIBOL's mines accounted for 78% of its total production, leased mines for 14%, purchases for 7%, and volatilization for 1%.

COMIBOL estimated its cost to produce and market tin at $2.85 per pound, up from $2.13 in 1973. Mining and depreciation costs were $1.51, export taxes were 55 cents, a net earnings tax was 21 cents, and handling, transportation, insurance, and smelting was 58 cents.

COMIBOL's output of about 4 million tons of ore, including purchased ore, assaying about 0.6% tin, was treated in concentration plants for an overall tin recovery of 56% contained in a concentrate of 43% tin.

COMIBOL estimated its measured, indicated, and inferred underground reserves of tin as 17.8 million tons assaying 0.95% tin. In addition, another 155 million tons of alluvial and dump material grading 0.21% tin exist on the surface, but the cost of processing these materials is uneconomical. An important project finished by COMIBOL for developing more tin reserves was the 7,000-foot crosscut at the Caracoles mine. The cut reportedly intersected 16 tin veins which average about 3 feet in width and contain 1% to 3% tin.

The expansion of the Vinto smelter operated by ENAF was scheduled to be completed by late 1975. The second phase, raising capacity to 19,700 long tons, was to be finished in 1977. In addition, ENAF was planning a smelter for low-grade tin ore in Vinto, so that by 1979 ENAF would have a smelting capacity of 30,000 tons, approximately all of Bolivia's current tin output.

**Tungsten.**—ENAF selected Shattuck Chemical Co. of the United States to study the feasibility of constructing a plant to convert tungsten concentrates to tungsten powder, tungsten carbide, and ammonium paratungstate. The plant, to be built in Viacha adjacent to the ferroalloy plant being built by SKODAEXPORT, would be owned by ENAF and International Mining Co. of Bolivia.

**Zinc.**—Of the total zinc mine production of 48,221 tons, COMIBOL supplied 32,590 tons, the Medium Miners 14,829 tons, and the Small Miners 802 tons. COMIBOL's production fell 20% from that of 1973, whereas the Medium Miners' production increased 36%.

The Dowa Mining Co. Ltd., of Japan pledged to loan $3.5 million to New Jersey Zinc Co. for the development of the Huari Huari mine north of Potosí. Dowa plans to purchase 55,000 tons of zinc concentrate per year for the next 10 years from the new flotation mill to be built at the mine.

### NONMETALS

**Sulfur.**—Sulfur production fell 26% from that of 1973. Most of the output was

exported to Chile. Inferred sulfur reserves were estimated at 70 million tons assaying 55% sulfur. The deposits occur along most of the Bolivian-Chilean border and are volcanic in origin.

## MINERAL FUELS

**Petroleum and Natural Gas.**—In 1974, the Bolivian petroleum industry continued to benefit significantly from the world's energy crisis. Yacimientos Petrolíferos Fiscales Bolivianos (YPFB) exported 10.8 million barrels of petroleum valued at $164.0 million in 1974, compared with 11.8 million barrels valued at $48 million in 1973. In addition, YPFB exported 54,593 million cubic feet of natural gas valued at $29.2 million, compared with 55,450 million cubic feet valued at $18.1 million in 1973. Almost all the gas went to Argentina. Production of both petroleum and natural gas was slightly lower in 1974 because Bolivia held out for higher petroleum prices late in the year and because a bridge collapsed at the Río Grande Field, disrupting production for 18 days. The price of natural gas to Argentina was renegotiated late in 1974 from $0.35 per thousand cubic feet to $0.65 per thousand cubic feet, retroactive to September 1, 1974.

Domestic petroleum consumption increased 7.2% over that of 1973, to 5,533,309 barrels. The largest increase was noted for liquefied petroleum gas (LPG), so much so that YPFB was forced to buy LPG from Chile toward yearend. High truck transportation costs forced YPFB to plan a gas pipeline distribution system because of increasing demand in La Paz, Santa Cruz, Oruro, and Cochabamba.

**Table 4.—Bolivia: Crude petroleum production by YPFB, by field**
(Thousand 42-gallon barrels)

| Field | 1973 | 1974 p |
|---|---|---|
| Rio Grande | 4,856 | 4,562 |
| Monteagudo | 3,465 | 2,978 |
| La Peña | 2,770 | 2,582 |
| Caranda | 2,625 | 2,034 |
| Colpa | 1,892 | 1,700 |
| Camiri | 695 | 602 |
| Tatarenda | 445 | 301 |
| Caigua | 273 | 1,651 |
| San Alberto | 83 | 70 |
| Bermejo | 66 | 49 |
| Toro | 60 | 51 |
| Camatindi | 28 | 20 |
| Tigre | 7 | 3 |
| Total | [1]17,266 | 16,603 |

p Preliminary.
[1] Data may not add to total shown because of independent rounding.
Source: Yacimientos Petrolíferos Fiscales Bolivianos.

**Table 5.—Bolivia: Consumption [1] of petroleum refinery products**
(Thousand 42-gallon barrels)

| Products | 1973 | 1974 |
|---|---|---|
| Jet fuel | 146 | 204 |
| Gasoline, aviation | 106 | 129 |
| Gasoline, motor | 1,983 | 2,085 |
| Kerosine | 958 | 1,015 |
| Diesel oil | 818 | 930 |
| Fuel oil | 749 | 889 |
| Lubricants | 62 | 65 |
| Liquefied petroleum gas | 163 | 258 |

[1] Figures refer to actual civilian and military consumption through sales to consumers, and including YPFB consumption.

The attractive investment climate in Bolivia led to increased private capital expenditures in petroleum exploration. By yearend 1974, YPFB had signed 14 operations contracts with foreign oil companies, both singly and in groups. Texaco Inc., Superior Oil Co., Tesoro Petroleum Corp., and Zapata Corp. joined the U.S. companies that had signed in 1973. In addition, French, Spanish, and Canadian companies signed contracts. Exploration investments in Bolivia from those contracts are expected to reach $60 million within the next 3 years.

Recoverable petroleum reserves were estimated at 160 million barrels. Measured, indicated, and inferred reserves of natural gas were estimated by YPFB to be 5 trillion cubic feet. A new natural gasfield was discovered by the Palacios No. 2 well in 1974.

YPFB paid Gulf Oil Co. $11,412,860, leaving $60,016,680 outstanding on its debt to Gulf for nationalization of Gulf's property in 1969. With the increase in gas and petroleum prices it is possible for YPFB to pay off the debt within 6 years.

YPFB's drilling operations declined from 110,845 feet drilled in 1973 to 78,375 feet drilled in 1974. Eight development wells were completed, including two wells drilled in the Caranda Field to put out a fire. Seven exploratory wells were completed including Palacios No. 2, which found gas horizons north-northwest of the city of Santa Cruz.

# The Mineral Industry of Brazil

By F. W. Wessel [1]

While mineral production in 1974 accounted for 2% of Brazil's gross national product and 11% of its export value, domestic demand continued to exceed production for many commodities.

Preliminary figures show that Brazil's mineral exports totaled $902 million [2] in 1974, major items of which were iron ore ($571 million), petroleum products ($110 million), manganese ore ($50 million), and ferroalloys ($49 million). However, mineral imports for the year reached $5.6 billion, of which 92% was accounted for by crude oil, steel, copper, and fertilizer materials.

A matter of major concern to Brazil was a reduction in its mineral imports. The Companhia Vale do Rio Doce (CVRD), established in 1947 as a government-operated organization for mining and marketing iron ore, had its authority and scope broadened to include many other commodities, and to include prospecting, shipping, and operating iron ore pelletizing plants. Capitalization of CVRD was increased to $447 million at midyear. To permit further development of the petrochemical industry, particularly with respect to nitrogenous fertilizers, the capitalization of the Government petrochemical corporation Petrobrás Química S.A. (PETROQUISA) was doubled, standing at $171 million at yearend.

Brazil was making a serious effort to improve transportation, port facilities, and the availability of power. Improvement of railroads serving the port cities of Paranaguá, Rio Grande, Santos, and Vitória, and planning and construction of new rail lines to Tubarão and Itaqui, were underway at yearend. Plans for a new iron ore terminal on Sepetiba Bay and for port facilities at Aratu were approaching finality.

Eletrobras, the Government power monopoly, claimed an estimated 17,400 megawatts of installed power by yearend, 13,900 megawatts being hydroelectric and the remainder thermal.

At midyear it was officially announced that preliminary plans for two hydroelectric plants on the Tocantins River had been approved by the President. The power will be needed to produce aluminum from the Trombetas bauxite deposit. A total capacity of 4,000 megawatts is expected to be available by 1981. The power sites designated were at São Félix and Tucuruí.

Final agreement between Brazil and Paraguay on development of power at Itaipu (Sete Quedas) on the Paraná River was reached early in the year. First production of 700 megawatts is scheduled for 1982, and completion of the project is scheduled for 1988. Construction of the first 625-megawatt nuclear unit at Angra dos Reis continued. Construction of a new unit of 1,200 megawatts at the site, to be completed in 1981, was announced in June. In addition, the Brazilian nuclear program includes eight reactors, at various locations, for a total capacity of 11,000 megawatts by 1990, and a parallel effort to achieve self-sufficiency in enrichment capability. Eletrobras does not intend to build more oil-burning thermal powerplants.

Decree 74,557, signed by the President on September 12, reformulated the Interministerial Commission for Resources of the Sea. The Commission as now constituted will be a policymaking and managerial tool.

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[1] Physical scientist, Division of Nonferrous Metals.

[2] Because of fluctuating exchange rates, meaningful conversion to U.S. dollars is impractical. At yearend, however, the exchange rate was New cruzeiros (NCr$) 7.435=US$1.00.

Voicing Brazilian position regarding formation of an iron ore producers' cartel, CVRD opposed Brazilian participation as not being in the nation's long-term interest, and raised doubts as to the effectiveness of such a cartel. CVRD preferred a policy of integration and cooperation between producers and consumers.

Final agreement with Bolivia concerning the development of Mutún iron ore, sale of natural gas to Brazil, and associated projects was signed on May 22. Feasibility studies of various phases began before year-end.

## PRODUCTION

Production of the three commodities of major domestic importance increased within the 0 to 10% range in 1974: Crude petroleum, 4.2%; steel ingot, 5.0%; and primary aluminum, 1.9%. Production of iron ore and bauxite increased 29.0% and 9.5%, respectively, but manganese ore output declined 16.6%. Mine production of copper increased 17.2%, zinc, 6.4%, and tin, 1.9%, but lead production was 3.2% less than in 1973. Base metal smelter production of lead, tin, and zinc increased 8.6%, 9.4%, and 37.1%, respectively, but copper smelter production was off 16.7%. Gold production was 9.8% higher, but silver output declined 23.2%. Pig iron production was up 5.7%, and ferroalloy production gained 23.8%. Mine production of nickel and of pyrochlore, however, declined 36.7% and 8.0%, respectively.

Nonmetallic minerals showed more general increases. Gains of 11.4% for cement, 13.6% for gypsum, 57.0% for magnesite, and 36.0% for asbestos were posted. Phosphate rock production declined 14.1% in $P_2O_5$ content. Shipments of quartz crystal were 75% greater, and sulfur production more than doubled its 1973 figure.

Coal production showed little change, but 27.7% more natural gas was marketed, and carbon black production increased 35.4%.

**Table 1.—Brazil: Production of mineral commodities [1]**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite, gross weight (dry basis) | [r] 610,855 | 703,152 | [e] 770,000 |
| Alumina | 192,027 | 230,948 | [e] 240,000 |
| Metal, primary | [r] 97,711 | 111,444 | 113,600 |
| Arsenic, white | 164 | 77 | 18 |
| Beryllium, beryl concentrate, gross weight | 1,551 | 1,210 | [e] 1,100 |
| Chromium, chromite, gross weight | 384,347 | 327,461 | [2] 112,311 |
| Columbium and tantalum, ore and concentrate, gross weight: | | | |
| Columbite | 65 | 169 | [e] 220 |
| Tantalite | 299 | | |
| Pyrochlore | 9,635 | 19,426 | 17,878 |
| Copper: | | | |
| Mine output, metal content | 4,455 | 3,412 | [e] 4,000 |
| Metal, smelter (blister) | 4,800 | 4,200 | 3,500 |
| Gold troy ounces | 203,771 | 223,319 | [3] 245,290 |
| Iron and steel: | | | |
| Ore and concentrate thousand tons | 46,471 | 55,019 | 71,000 |
| Metal: | | | |
| Pig iron excluding ferroalloys do | 5,300 | 5,532 | 5,846 |
| Ferroalloys: | | | |
| Ferrochromium | [r] 11,656 | 15,492 | 33,932 |
| Ferrocolumbium | 2,782 | 6,093 | 6,900 |
| Ferromanganese | [r] 73,334 | 76,920 | 77,005 |
| Ferronickel | [r] 10,813 | 9,998 | 9,853 |
| Ferrosilicon | [r] 23,745 | 40,221 | 51,948 |
| Silicomanganese | [r] 16,806 | 23,324 | 35,269 |
| Other and unspecified | [r] 668 | 4,482 | 3,676 |
| Total | [r] 139,804 | 176,530 | 218,583 |
| Steel: | | | |
| Crude, excluding castings thousand tons | 6,518 | 7,149 | 7,503 |
| Semimanufactures do | [r] 5,302 | 5,975 | 6,068 |

See footnotes at end of table.

## Table 1.—Brazil: Production of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| METALS—Continued | | | |
| Lead: | | | |
| Mine output, metal content | 29,880 | 25,946 | 25,104 |
| Metal, smelter, primary | 25,007 | 38,400 | 41,686 |
| Manganese ore and concentrate (marketable), gross weight ---- thousand tons | 2,058 | [e] 2,157 | [e] 1,800 |
| Nickel: | | | |
| Mine output, metal content | 3,398 | 4,122 | 2,608 |
| Ferroalloy, nickel content | 2,702 | 2,700 | [e] 2,700 |
| Rare earth, monazite concentrate, gross weight | 2,089 | 1,439 | [e] 1,400 |
| Silver ---- thousand troy ounces | 320 | 327 | 251 |
| Tin: | | | |
| Mine output, metal content ---- long tons | 2,769 | 3,683 | [e] 3,754 |
| Metal, smelter, primary ---- do | 3,526 | [e] 4,363 | [e] 4,771 |
| Titanium: | | | |
| Ilmenite concentrate, gross weight | 3,791 | 10,301 | [e] 10,000 |
| Rutile concentrate, gross weight | 412 | 42 | [e] 200 |
| Tungsten, mine output, metal content | 1,141 | 995 | [e] 1,000 |
| Uranium | 3 | NA | NA |
| Zinc: | | | |
| Mine output, metal content [e] | [r] 16,100 | [r] 32,900 | 35,000 |
| Metal, smelter | 15,557 | 22,256 | 30,519 |
| Zirconium concentrate, gross weight, zircon [4] | [r] 4,214 | 3,094 | [e] 3,000 |
| NONMETALS | | | |
| Abrasives, natural, n.e.s., corundum and emery | 3,516 | 4,038 | NA |
| Asbestos, fiber | 32,883 | 44,868 | 61,000 |
| Barite | [r] 87,614 | 53,531 | [e] 55,000 |
| Cement, hydraulic (including pozzolanic) thousand tons | 11,381 | 13,398 | 14,920 |
| Clays, n.e.s.: | | | |
| Bentonite | 38,185 | 43,791 | [e] 44,000 |
| Kaolin: | | | |
| Crude | 542,718 | 515,333 | NA |
| Beneficiated | [r] 129,566 | 189,245 | [e] 190,000 |
| Other: | | | |
| Crude | 1,695,496 | 1,744,020 | NA |
| Beneficiated | 664,158 | 306,495 | NA |
| Diamond: [5] [e] | | | |
| Gem ---- thousand carats | [r] 155 | [r] 160 | 160 |
| Industrial ---- do | [r] 155 | [r] 160 | 160 |
| Total ---- do | 310 | [r] 320 | 320 |
| Diatomite | [6] 893 | 702 | [e] 700 |
| Feldspar | 67,373 | 90,581 | [e] 100,000 |
| Fertilizer materials: | | | |
| Crude phosphates, phosphate rock (includes apatite): | | | |
| Gross weight | [e] 200,000 | 257,042 | 221,000 |
| $P_2O_5$ content | 103,940 | 145,446 | [e] 125,000 |
| Manufactured: | | | |
| Nitrogenous (nitrogen content) | 88,493 | 140,292 | NA |
| Phosphatic ($P_2O_5$ content) | 277,624 | 337,597 | NA |
| Fluorspar | 70,974 | 70,705 | [e] 73,000 |
| Graphite, all grades | 3,570 | 2,842 | [e] 3,000 |
| Gypsum and anhydrite, crude | 237,964 | 352,055 | [e] 400,000 |
| Lime [e] ---- thousand tons | 2,000 | 2,000 | 2,000 |
| Lithium minerals [7] | -- | 4,811 | 2,158 |
| Magnesite | 276,673 | 275,233 | 432,000 |
| Mica, all grades [8] | 2,581 | 1,739 | [e] 1,800 |
| Precious and semiprecious stones, except diamond: | | | |
| Crude and worked: | | | |
| Agate [8] | 1,032 | 1,315 | 2,267 |
| Other stones [8] | [r] 753 | 767 | |
| Quartz, crystal, all grades [8] | 3,259 | 4,368 | 7,657 |
| Salt, marine ---- thousand tons | 2,168 | 1,855 | [e] 1,900 |
| Stone, n.e.s.: | | | |
| Dimension stone, marble | 45,816 | 67,428 | NA |
| Crushed and broken: | | | |
| Dolomite ---- thousand tons | 886 | 1,339 | NA |
| Limestone ---- do | 19,519 | 26,152 | NA |
| Quartz [9] | 21,484 | 15,694 | NA |
| Quartzite: | | | |
| Crude | 333,769 | 464,728 | NA |
| Processed [10] | 91,630 | 91,780 | NA |
| Sulfur, elemental, byproduct [e] | 9,200 | 3,100 | 6,400 |
| Talc | 88,733 | 96,955 | [e] 100,000 |
| Vermiculite [e] | 4,500 | [r] 4,500 | 4,500 |

See footnotes at end of table.

**Table 1.—Brazil: Production of mineral commodities [1]—Continued**
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Carbon black | | 65,200 | [e] 65,000 | [e] 88,000 |
| Coal, bituminous (washed) | thousand tons | [r] 2,469 | 2,460 | [e] 2,500 |
| Coke: | | | | |
| Metallurgical | do | [r] 1,779 | 1,790 | [e] 1,800 |
| Gashouse | do | 45 | 37 | [e] 37 |
| Gas: | | | | |
| Manufactured, all types | million cubic feet | 11,021 | 15,490 | NA |
| Natural: | | | | |
| Gross withdrawal | do | 43,861 | 41,668 | 52,972 |
| Marketed production [e] | do | 8,500 | 8,300 | 10,600 |
| Natural gas liquids | thousand 42-gallon barrels | 1,497 | 1,421 | 1,699 |
| Petroleum: | | | | |
| Crude | do | [r] 61,085 | 62,120 | 64,755 |
| Refinery products: | | | | |
| Gasoline | do | 72,088 | 79,113 | 80,430 |
| Jet fuel | do | 6,400 | 8,071 | 9,139 |
| Kerosine | do | 4,214 | 6,410 | 4,271 |
| Distillate fuel oil | do | 54,382 | 62,834 | 68,970 |
| Residual fuel oil | do | 73,815 | 87,812 | 87,198 |
| Lubricants | do | 76 | 565 | 962 |
| Other | do | 24,025 | 27,620 | 35,758 |
| Refinery fuel and losses | do | 4,077 | 13,576 | 9,682 |
| Total | do | 239,077 | 286,001 | 296,410 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to the commodities listed, molybdenite, bismuth, and a variety of crude construction materials (sand, gravel, and additional unlisted varieties of stone) are also produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.
[2] Concentrate.
[3] Partially estimated on placer gold.
[4] Includes baddeleyite-caldesite.
[5] By far the larger part of Brazil's diamond production is not reported statistically; hence, the estimates tabulated are based only on very general marked information.
[6] Partial figure.
[7] Reported U.S. imports from Brazil.
[8] Exports.
[9] This material apparently includes crude quartz used to produce quartz crystal (listed separately in this table) as well as additional unreported quantities in common quartz.
[10] Produced from a portion of the crude quartzite listed above; quantity of crude quartzite processed was not available in 1972; and 876,674 tons in 1973 (1974 not available).

## TRADE

In terms of value, exports from Brazil in 1973 were 17.9% to the United States, 10.0% to the Netherlands, and 9.0% to West Germany. Brazil's exports of iron ore, $363 million in 1973, increased 57% to $571 million in 1974. Brazilian imports originated in the United States (28.3%), West Germany (13.0%), and Japan (8.6%).

Data for mineral commodity imports in 1973 and 1974 follow:

| | Value (million dollars) | | Percent increase | |
|---|---|---|---|---|
| | 1973 | 1974 | Value | Quantity |
| Mineral fuels | 769 | 2,895 | 276 | 2 |
| Iron and steel | 493 | 1,535 | 211 | 133 |
| Fertilizers | 139 | 403 | 190 | 28 |
| Copper | 164 | 329 | 101 | 43 |
| Aluminum | 51 | 132 | 159 | 77 |
| Zinc | 41 | 76 | 85 | −18 |

Notable increases in exports from 1972 to 1973 included steel ingot, 139%; pig iron, 67%; iron ore, 47%; silver, 91%; pyrochlore, 32.0%; barite, 117%; and magnesite, 46%. Decreases included chromite, 6%; manganese ore, 33%; tungsten ore and concentrate, 22%; and industrial diamond, 36%.

Increased imports for the same period included steel ingot, 21%; aluminum, 12%; copper, 11%; lead 168%; zinc, 43%; chromite, 144%; ilmenite, 81%; cassiterite, 5%; asbestos, 11%; bentonite, 63%; industrial diamond, 28%; crude nitrogenous fertilizer, 16%; crude phosphatic fertilizer, 9%; manufactured potassic fertilizer, 15%; sodium compounds, 31%; sulfur, 22%; sulfuric acid, 952%; and crude petroleum, 39.5%. Decreases were few. Cement imports were 3.5% less, manufactured nitrogenous and phosphatic fertilizers declined 28% and 25%, respectively, and imports of coke were off 34.5%.

In September, Brazil and Canada concluded a trade agreement providing for shipment of Brazilian iron ore to Canada and Canadian coal to Brazil, using the same ships as carriers.

**Table 2.—Brazil: Exports and reexports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 4,430 | 4,629 | Uruguay 2,300; Argentina 2,289. |
| Oxide (alumina) and hydroxide [1] | r 1,362 | 1,903 | Argentina 1,149; Mexico 611; Uruguay 67. |
| Metal including alloys: | | | |
| Unwrought | 157 | -- | |
| Semimanufactures | 150 | 34 | Paraguay 64; Peru 24; Angola 13. |
| Antimony: | | | |
| Ore and concentrate | 10 | -- | |
| Metal including alloys, all forms | 108 | 34 | United States 15; Japan 15. |
| Beryl ore and concentrate | 1,551 | 1,210 | United States 826; Japan 384. |
| Chromium, chromite | 37,196 | 34,924 | Japan 34,862; Argentina 62. |
| Columbium and tantalum ore and concentrate: | | | |
| Columbite | 4 | 26 | United States 24; West Germany 2. |
| Tantalite | 164 | 133 | United States 72; West Germany 33; Netherlands 20. |
| Pyrochlore | 4,884 | 6,445 | West Germany 2,007; United Kingdom 1,188; United States 1,015. |
| Copper metal including alloys, all forms | r 2,226 | 1,925 | Japan 876; France 300; Uruguay 190. |
| Gold metal, unworked or partly worked, all forms -- troy ounces | 32 | 1,125 | Puerto Rico 1,029; Spain 96. |
| Iron and steel: | | | |
| Ore and concentrate, including roasted pyrite thousand tons | 30,512 | 44,963 | Japan 13,346; West Germany 11,065; United States 3,726. |
| Metal: | | | |
| Scrap | 24 | 65 | All to Paraguay. |
| Pig iron | 255,712 | 428,040 | Japan 125,536; Venezuela 90,958; United States 82,553. |
| Sponge iron, powder, and shot | 66 | 155 | Argentina 75; Venezuela 70; Uruguay 10. |
| Ferroalloys: | | | |
| Ferrochrome | 6,704 | 10,372 | United States 6,470; Canada 2,600; Netherlands 850. |
| Ferromanganese | 22,720 | 21,413 | Venezuela 6,900; United States 5,800; Netherlands 5,700. |
| Ferromolybdenum | -- | 186 | Japan 74; Argentina 53; United States 30. |
| Ferronickel | 7,195 | 3,368 | Japan 2,329; Argentina 883; Spain 100. |
| Ferrosilicon | 3,780 | 3,100 | Colombia 1,995; Canada 700; United States 430. |
| Other | 3,006 | 5,756 | United States 2,123; Japan 1,180; Netherlands 675. |
| Steel, primary forms | 79,881 | 191,236 | Japan 61,114; Argentina 60,013; Ecuador 28,211. |
| Semimanufacturers: | | | |
| Bars, rods, angles, shapes, sections | 151,339 | 124,436 | United States 40,466; Puerto Rico 34,642; Spain 15,411. |
| Universals, plates, sheets | 171,334 | 103,751 | United States 45,582; Argentina 26,541; Uruguay 16,145. |
| Hoop and strip | 412 | 351 | Uruguay 138; Paraguay 103. |

See footnotes at end of table.

## Table 2.—Brazil: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Semimanufactures—Continued | | | |
| Wire | 2,625 | 2,490 | Colombia 1,900; Venezuela 421; Bolivia 116. |
| Tubes, pipes, fittings | 9,202 | 5,539 | Peru 1,343; West Germany 600; Paraguay 591. |
| Castings and forgings, rough | 1,654 | 1,485 | United States 1,209; Bolivia 179. |
| Lead metal including alloys, all forms | 22 | 229 | Colombia 128; Bolivia 101. |
| Manganese ore and concentrate thousand tons | 1,175 | 788 | United States 250; United Kingdom 113; Norway 110. |
| Mercury 76-pound flasks | -- | 1 | All to Bolivia. |
| Molybdenum: | | | |
| Ore and concentrate | -- | 38 | Netherlands 25; Republic of South Africa 13. |
| Metal including alloys, all forms kilograms | 10 | 738 | All to United States. |
| Nickel metal including alloys, all forms | r 5 | 3 | Mainly to Colombia. |
| Platinum-group metals and silver, including alloys: | | | |
| Platinum group troy ounces | r 19,098 | 157,249 | Spain 134,679; Belgium-Luxembourg 17,008; Ireland 1,511. |
| Silver do | r 414,808 | 793,190 | France 567,749; West Germany 111,049; Spain 108,637. |
| Rare-earth metals: | | | |
| Ore and concentrate, except monazite | 1,379 | 719 | Japan 253; Austria 177; United States 150. |
| Oxides | 10 | 50 | All to Japan. |
| Metals including alloys: | | | |
| Cerium | 76 | 185 | United Kingdom 78; France 30; Belgium-Luxembourg 26. |
| Other | 3 | 5 | Belgium-Luxembourg 3; Italy 2. |
| Total | 79 | 190 | |
| Tin: | | | |
| Ore and concentrate long tons | 30 | 39 | West Germany 29; United States 10. |
| Metal including alloys, all forms do | r 1,365 | 1,205 | United States 594; Argentina 261; Netherlands 98. |
| Titanium: | | | |
| Oxides kilograms | -- | 100 | All to Paraguay. |
| Metal including alloys, all forms do | -- | 120 | All to Colombia. |
| Tungsten: | | | |
| Ore and concentrate | 1,725 | 1,348 | Sweden 520; West Germany 362; United States 310. |
| Metal including alloys, all forms | 1 | 2 | Mainly to United States and Argentina. |
| Zinc: | | | |
| Oxide | 650 | 389 | United States 387. |
| Metal including alloys, all forms | r 1,634 | 33 | Mainly to Uruguay. |
| Other: | | | |
| Ore and concentrate, n.e.s | 196 | 4,809 | United States 2,997; Netherlands 1,000; Japan 612. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | 43 | 50 | United States 20; Argentina 10; Mexico 9. |
| Metals including alloys, all forms: | | | |
| Pyrophoric alloys kilograms | 142 | -- | |
| Waste and sweepings of precious metals do | -- | 17,250 | All to West Germany. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Emery | 8 | 4 | Mainly to Argentina. |
| Grinding and polishing wheels and stones | 167 | 203 | Colombia 55; Chile 35; Japan 29. |
| Asbestos | 200 | 102 | France 100; Japan 2. |
| Barite and witherite | 21,916 | 47,659 | Venezuela 25,818; Trinidad and Tobago 21,841. |
| Boron materials, oxide and acid | -- | 1 | All to Colombia. |
| Cement | 1,374 | 114,438 | Nigeria 86,200; Guyana 16,237; Senegal 10,000. |

See footnotes at end of table.

## Table 2.—Brazil: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 20 | 2 | All to Chile. |
| Kaolin | 2,511 | 2,878 | Uruguay 1,477; Argentina 800; Italy 501. |
| Other | 18 | 33 | Paraguay 32; Netherlands 1. |
| Products: | | | |
| Refractory (including nonclay bricks) | r 4,741 | 4,217 | Argentina 2,885; Poland 515; Uruguay 403. |
| Nonrefractory | r 4,778 | 9,310 | Paraguay 4,823; United States 1,008; Trinidad and Tobago 625. |
| Diamond: | | | |
| Gem, not set or strung carats | 20,440 | 11,070 | Netherlands 8,640; Spain 1,560; United States 870. |
| Industrial do | 24,790 | 15,945 | Netherlands 9,005; United States 2,745; Belgium-Luxembourg 1,470. |
| Diatomite and other infusorial earths kilograms | -- | 125 | All to Paraguay. |
| Fertilizer materials: | | | |
| Crude, phosphatic | (2) | -- | |
| Manufactured: | | | |
| Nitrogenous | 80 | 301 | Bolivia 281; Paraguay 20. |
| Phosphatic | 30 | 8,641 | Uruguay 8,301; Paraguay 310; Argentina 30. |
| Potassic | 300 | 240 | Paraguay 233; Bolivia 7. |
| Other, including mixed | 7,840 | 9,522 | Uruguay 6,837; Paraguay 1,762; Bolivia 826. |
| Ammonia | 2 | 2 | All to Paraguay. |
| Fluorspar | 26,835 | 24,936 | U.S.S.R. 11,000; United States 10,646; Australia 2,100. |
| Graphite, natural | -- | 10 | All to Argentina. |
| Lime | 28 | 20 | Bolivia 13; Paraguay 7. |
| Magnesite | r 38,285 | 55,910 | Poland 10,000; Argentina 7,780; Chile 6,300. |
| Mica: | | | |
| Crude, including splittings and waste | 2,578 | 1,738 | United States 854; Norway 500; Japan 254. |
| Worked, including agglomerated splittings | 3 | 1 | Mainly to United States. |
| Pigments, mineral, iron oxides, processed | 3 | 1 | All to Bolivia. |
| Precious and semiprecious stones, except diamond, crude and worked: | | | |
| Agate kilograms | r 1,031,654 | 1,314,530 | Japan 521,422; United States 429,950; West Germany 214,051. |
| Amethyst do | r 242,968 | 314,731 | Japan 104,324; West Germany 50,989; United States 48,856. |
| Aquamarine do | 10,828 | 3,864 | Japan 2,090; West Germany 972; United States 686. |
| Cat's eye do | r 30 | 1 | All to Hong Kong. |
| Citrine do | 30,148 | 45,351 | Japan 27,203; West Germany 7,834; Italy 5,470. |
| Emerald do | 7,398 | 11,665 | Switzerland 4,221; India 4,056; United Kingdom 1,272. |
| Garnet do | 1,069 | 7,339 | Japan 6,179; France 515; United States 515. |
| Opal do | r 476 | 701 | United States 245; Hong Kong 181; Japan 123. |
| Sapphire do | r 1 | (2) | Mainly to United States and Italy. |
| Topaz do | r 7,586 | 2,204 | West Germany 634; Japan 418; United States 312. |
| Tourmaline do | 6,888 | 3,670 | United States 1,404; Japan 813; West Germany 673. |
| Turquoise do | r 3 | -- | |
| Other do | r 445,776 | 377,801 | Japan 123,433; United States 65,648; West Germany 58,019. |
| Quartz crystal: | | | |
| Electronic and optical grade | 80 | 39 | Japan 31; United States 4; France 2. |
| Other | 3,179 | 4,329 | West Germany 1,554; Japan 694; France 642. |
| Salt | 1,406 | 26 | Paraguay 24. |

See footnotes at end of table.

## Table 2.—Brazil: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Sodium and potassium compounds, n.e.s | (2) | 3,311 | All to Argentina. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | r 11,378 | 17,324 | Italy 8,398; Japan 6,083; United States 983. |
| Worked | 1,925 | 3,325 | Japan 2,233; United States 568; Mexico 284. |
| Dolomite, chiefly refractory grade | 858 | 1,258 | Argentina 905; Colombia 350. |
| Quartz and quartzite | 146 | 201 | Belgium-Luxembourg 147; Netherlands 40; West Germany 10. |
| Sand, excluding metal bearing | 98 | 10 | Mainly to West Germany. |
| Sulfur: | | | |
| Sulfur dioxide ____ kilograms | -- | 68 | All to Ecuador. |
| Sulfuric acid, oleum | 30 | (2) | All to Paraguay. |
| Talc, steatite, soapstone, pyrophyllite | 101 | 428 | Colombia 260; United States 128. |
| Vermiculite | 332 | 30 | All to Spain. |
| Other nonmetals, n.e.s.: | | | |
| Crude | (2) | 1 | All to Paraguay. |
| Slag, dross, and similar waste, not metal bearing: | | | |
| From iron and steel manufacture | 10 | 90 | All to Argentina. |
| Slag and ash, n.e.s | 25 | -- | |
| Oxide and hydroxide of barium | -- | 32 | All to United States. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 11 | 1 | All to Bolivia. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | (2) | 2 | Do. |
| Carbon black | r 367 | 202 | Uruguay 198; Chile 4. |
| Coke and semicoke of coal, lignite, or peat | r 8 | 18,352 | Netherlands 18,347; Bolivia 5. |
| Hydrogen and rare gases kilograms | -- | 477 | Argentina 440; United States 37. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | r 7,676 | 14,851 | Italy 7,491; Bahamas 3,433; Netherlands Antilles 2,076. |
| Refinery products: | | | |
| Gasoline: | | | |
| Aviation ____ do | 22 | 57 | Uruguay 35; Peru 18. |
| Motor ____ do | 101 | 95 | All to Peru. |
| Jet fuel ____ do | 43 | 75 | Peru 67; Paraguay 8. |
| Kerosine ____ do | 346 | 625 | Trinidad and Tobago 421; Uruguay 119; United States 73. |
| Distillate fuel oil ____ do | 7,320 | 12,230 | United States 6,162; Argentina 3,378; Netherlands 914. |
| Residual fuel oil ____ do | 995 | 105 | All to Argentina. |
| Lubricants (including grease) ____ do | -- | (2) | Mainly to Peru. |
| Other: | | | |
| Liquefied petroleum gas ____ do | 151 | 239 | Uruguay 101; Surinam 55; Mexico 42. |
| Naphtha ____ do | 71 | -- | |
| Mineral jelly and wax ____ do | 6 | 38 | Peru 13; United States 12; Republic of South Africa 4. |
| Pitch ____ do | 31 | 49 | All to Uruguay. |
| Not specified ____ do | 1 | (2) | Mainly to Bolivia. |
| Total ____ do | 9,087 | 13,513 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | r 788 | 40 | All to Argentina. |

r Revised.
1 Includes alumina gel.
2 Less than ½ unit.

## Table 3.—Brazil: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 4,040 | 8,292 | Guyana 4,694; United States 3,588. |
| Oxide (alumina) and hydroxide | 1,705 | 1,708 | West Germany 1,143; United States 545. |
| Metal including alloys: | | | |
| Scrap | 781 | 4,987 | United States 4,035; Canada 883; Puerto Rico 35. |
| Unwrought | 44,378 | 49,839 | Canada 11,810; Norway 11,689; France 9,748. |
| Semimanufactures | r 7,793 | 12,778 | United States 6,479; France 2,241; Argentina 693. |
| Antimony: | | | |
| Ore and concentrate | 600 | 452 | Peru 175; Thailand 100; Bolivia 85. |
| Metal including alloys, all forms | 136 | 128 | Netherlands 58; United States 37; Belgium-Luxembourg 21. |
| Arsenic: | | | |
| Trioxide, pentoxide, and acids | r 732 | 723 | France 384; West Germany 188; Netherlands 85. |
| Metal including alloys, all forms | 26 | 31 | Netherlands 16; Sweden 11. |
| Beryllium metal including alloys, all forms kilograms | 104 | 51 | Italy 50; Japan 1. |
| Bismuth metal including alloys, all forms | 21 | 20 | Mexico 17. |
| Cadmium metal including alloys, all forms | 101 | 102 | Mexico 68; Peru 11; West Germany 8. |
| Chromium: | | | |
| Chromite | 4,737 | 11,554 | Philippines 9,572; Republic of South Africa 1,711; United States 221. |
| Oxide and hydroxide | 264 | 282 | West Germany 151; U.S.S.R. 89; Poland 25. |
| Metal including alloys, all forms | 16 | 29 | Japan 21; United Kingdom 6. |
| Cobalt: | | | |
| Oxide and hydroxide | 82 | 92 | Belgium-Luxembourg 69; Canada 10; United States 10. |
| Metal including alloys, all forms | 144 | 217 | Belgium-Luxembourg 178; United States 32. |
| Columbium and tantalum, tantalum metal including alloys, all forms kilograms | 28 | 61 | United States 41; Belgium-Luxembourg 16. |
| Copper: | | | |
| Copper sulfate | 3,680 | 3,751 | Peru 1,512; United Kingdom 646; Mexico 585. |
| Metal including alloys: | | | |
| Scrap | 24 | 997 | United States 768; Canada 112; Belgium-Luxembourg 82. |
| Unwrought | r 84,940 | 94,517 | Zambia 32,485; United States 20,042; Chile 10,876. |
| Semimanufactures | r 1,243 | 1,492 | United States 603; West Germany 464; United Kingdom 117. |
| Gold metal, unworked or partly worked troy ounces | 374,909 | 107,641 | United Kingdom 40,574; United States 40,060; Canada 16,558. |
| Iron and steel: | | | |
| Ore and concentrate | 4 | 305 | West Germany 250; Netherlands 50; United States 5. |
| Metal: | | | |
| Scrap | 31,873 | 21,763 | Mainly from United States. |
| Sponge iron, powder and shot | r 4,838 | 6,481 | United States 4,100; Japan 1,279; West Germany 975. |
| Ferroalloys | r 9,219 | 6,766 | Republic of South Africa 4,475; France 987; United States 869. |
| Steel, primary forms | 345,201 | 418,700 | Spain 165,370; United States 96,920; Japan 65,189. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes sections | 95,673 | 183,390 | Argentina 67,162; United States 35,351; Japan 29,329. |
| Universals, plates, sheets thousand tons | 411 | 1,004 | Japan 349; United States 245; West Germany 142. |
| Hoop and strip | 22,147 | 31,800 | West Germany 14,174; Japan 8,685; United States 2,705. |
| Rails and accessories | 84,325 | 78,005 | United States 42,170; West Germany 22,790; Japan 9,412. |

See footnotes at end of table.

## Table 3.—Brazil: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Metal—Continued | | | |
| Semimanufactures—Continued | | | |
| Wire | 21,008 | 23,623 | Argentina 13,314; West Germany 2,678; Japan 2,505. |
| Tubes, pipes, fittings | 44,185 | 49,301 | United States 14,860; Sweden 6,633; West Germany 4,975. |
| Castings and forgings, rough | 1,770 | 792 | United Kingdom 237; Belgium-Luxembourg 207; Italy 155. |
| Ingots, high-carbon and alloy steel | 10 | 48 | United States 22; United Kingdom 20. |
| Lead: | | | |
| Oxides | 541 | 1,651 | Mexico 1,441; West Germany 123; United States 43. |
| Metal including alloys, all forms | r 8,471 | 22,726 | United States 12,255; Mexico 8,508; Peru 907. |
| Magnesium metal including alloys, all forms | r 7,571 | 9,552 | United States 4,270; Norway 4,055. |
| Manganese: | | | |
| Ore and concentrate | 4,437 | 9,289 | Gabon 8,668; Belgium-Luxembourg 512; United States 80. |
| Oxides | 832 | 1,165 | Japan 934; United States 223. |
| Metal | 448 | 245 | Japan 201; United States 14. |
| Mercury 76-pound flasks | r 3,334 | 3,741 | Mexico 3,515; Peru 200. |
| Molybdenum: | | | |
| Ore and concentrate | 461 | 1,069 | United States 656; Canada 293; Spain 120. |
| Metal including alloys, all forms | 16 | 22 | United States 9; Netherlands 6; West Germany 2. |
| Nickel: | | | |
| Matte, speiss, and similar materials | (1) | (1) | All from West Germany. |
| Metal including alloys: | | | |
| Scrap | 8 | -- | |
| Unwrought | r 1,935 | 1,642 | United States 949; Netherlands 234; West Germany 122. |
| Semimanufactures | r 632 | 863 | France 268; United States 259; West Germany 77. |
| Platinum-group metals including alloys, all forms: | | | |
| Platinum troy ounces | 3,215 | 8,198 | United States 5,851; West Germany 997; France 611. |
| Other, including alloys thousand troy ounces | 1,989 | 52 | United States 39; West Germany 9; Netherlands 2. |
| Rare-earth metals kilograms | 2,754 | 4,614 | Mainly from United States. |
| Selenium, elemental | 12 | 20 | Peru 8; Canada 7; United States 3. |
| Silicon metal | r 2,382 | 2,231 | Norway 1,735; France 386; Italy 63. |
| Silver metal including alloys thousand troy ounces | 2,704 | 3,964 | West Germany 1,617; United States 1,020; Peru 488. |
| Sodium metal | 14 | 13 | Mainly from West Germany. |
| Tellurium, elemental | 344 | 630 | Canada 600. |
| Tin: | | | |
| Ore and concentrate long tons | r 3,022 | 3,163 | Bolivia 1,418; Singapore 1,158; Peru 205. |
| Oxides do | r 106 | 92 | United Kingdom 47; West Germany 43. |
| Metal including alloys, all forms do | r 14 | 11 | United States 9. |
| Titanium: | | | |
| Ore and concentrate: | | | |
| Ilmenite | 20,829 | 37,765 | All from Australia. |
| Rutile | 2,654 | 2,310 | Australia 1,678; Netherlands 408; Austria 169. |
| Oxides | r 3,051 | 2,173 | West Germany 679; France 480; Belgium-Luxembourg 127. |
| Metal including alloys, all forms | r 56 | 31 | United States 24; West Germany 2. |
| Tungsten metal including alloys, all forms | 15 | 25 | United States 12; Netherlands 4; West Germany 3. |
| Uranium and thorium: | | | |
| Oxides including rare-earth oxides | 55 | 94 | United States 60; Portugal 24; France 2. |
| Metals including alloys, all forms kilograms | 1 | (1) | All from United States. |

See footnotes at end of table.

## Table 3.—Brazil: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Vanadium: | | | |
| Oxides | 128 | 281 | Republic of South Africa 181; France 73; West Germany 19. |
| Metal including alloys, all forms | r 2 | 6 | Mainly from United States. |
| Zinc: | | | |
| Ore and concentrate _ kilograms | 9 | -- | |
| Oxide | 332 | 259 | West Germany 110; Portugal 50; United States 48. |
| Metal including alloys: | | | |
| Unwrought | 54,133 | 77,558 | Peru 24,725; Belgium-Luxembourg 10,734; Zambia 8,142. |
| Semimanufactures | 147 | 282 | Norway 110; Belgium-Luxembourg 51; West Germany 42. |
| Zirconium and hafnium: | | | |
| Ore and concentrate | 5,635 | 6,247 | United States 3,281; Australia 2,662; Netherlands 199. |
| Metal including alloys, all forms | (1) | 1 | Mainly from West Germany. |
| Other: | | | |
| Ore and concentrate | (1) | -- | |
| Ash and residue containing nonferrous metals | 798 | 3,001 | United States 1,669; Republic of South Africa 413; Canada 379. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | 1,169 | 1,516 | West Germany 638; United States 298; Belgium-Luxembourg 162. |
| Waste and sweepings of precious metals kilograms | 16 | 32 | West Germany 20; Italy 12. |
| Metals including alloys, all forms: | | | |
| Alkali and alkaline earth metals, n.e.s do | 121 | 88 | United Kingdom 40; Italy 36. |
| Pyrophoric alloys | (1) | 3 | France 2. |
| Base metals including alloys, all forms, n.e.s | 8 | 2 | United States 1. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | r 1,493 | 1,525 | Italy 1,254; United States 238; West Germany 27. |
| Dust and powder of precious and semiprecious stones kilograms | 77 | 136 | United States 93; Denmark 19; Ireland 12. |
| Grinding and polishing wheels and stones | 394 | 369 | West Germany 188; United States 104; Italy 17. |
| Asbestos | 19,689 | 21,881 | Canada 12,608; Republic of South Africa 5,041; United States 2,026. |
| Barite and witherite | 59 | 123 | United States 83; West Germany 30; United Kingdom 10. |
| Boron materials: | | | |
| Crude natural borates | 11,045 | 10,886 | Argentina 5,320; Netherlands 3,886; United States 1,482. |
| Oxide and acid | 2,613 | 3,564 | United States 1,888; West Germany 1,151; Netherlands 368. |
| Bromine | 38 | 5 | Mainly from Israel. |
| Cement | r 244,335 | 235,677 | Uruguay 134,215; U.S.S.R. 50,120; Colombia 32,414. |
| Chalk | r 2,313 | 3,951 | France 1,585; United States 998; Belgium-Luxembourg 800. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 11,822 | 19,263 | United States 12,135; Argentina 7,045; Japan 56. |
| Fire clay | 11 | 1,063 | United States 1,029; West Germany 22; Japan 7. |
| Kaolin | r 6,543 | 10,831 | United States 10,599; United Kingdom 219. |
| Andalusite, kyanite, sillimanite | 14 | 186 | United States 100; Japan 76; Mozambique 10. |
| Other | 2,559 | 2,493 | United States 2,143; United Kingdom 332; Argentina 10. |
| Products: | | | |
| Refractory (including nonclay bricks) | r 20,221 | 20,949 | Japan 9,563; United States 6,527; West Germany 809. |
| Nonrefractory | 1,644 | 1,537 | Italy 938; Spain 544. |

See footnotes at end of table.

## Table 3.—Brazil: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Cryolite and chiolite | 645 | 1,722 | All from Denmark. |
| Diamond: | | | |
| Gem, not set or strung[2] carats | r 250,000 | 320,000 | Belgium-Luxembourg 285,000; United States 30,000. |
| Industrial do | 145,000 | 185,000 | Ireland 65,000; United States 50,000; Switzerland 45,000. |
| Diatomite and other infusorial earths | 937 | 1,347 | United States 484; West Germany 388; United Kingdom 300. |
| Feldspar | 6 | 20 | Mainly from Netherlands. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 24,842 | 28,800 | All from Chile. |
| Phosphatic | 858,927 | 933,043 | United States 640,024; Morocco 172,544; Tunisia 77,580. |
| Potassic | -- | (1) | All from Spain. |
| Manufactured: | | | |
| Nitrogenous | 902,927 | 653,487 | West Germany 227,910; Netherlands 189,820; United States 181,464. |
| Phosphatic: | | | |
| Thomas slag | 17,743 | 25,562 | Belgium-Luxembourg 16,068; West Germany 9,494. |
| Other | 692,194 | 513,149 | United States 289,221; Morocco 50,105; Mexico 49,071. |
| Potassic | 765,228 | 878,721 | United States 417,483; Canada 150,202; France 70,960. |
| Other, including mixed | 515,897 | 391,795 | United States 326,178; Venezuela 33,194; Chile 18,350. |
| Ammonia | 30,762 | 56,654 | United States 31,042; Iran 17,600; Kuwait 8,005. |
| Fluorspar | 31 | 104 | United States 79; Uinted Kingdom 21; Netherlands 4. |
| Graphite, natural | 131 | 103 | Malagasy Republic 66; Mexico 20; United States 11. |
| Gypsum and plasters | 2,224 | 2,076 | Bolivia 1,873; United Kingdom 142; Belgium-Luxembourg 50. |
| Iodine kilograms | 43,483 | 74,816 | Chile 59,300; Belgium-Luxembourg 5,000; Argentina 3,280. |
| Lithium minerals, spodumene do | 8,845 | 27,827 | United States 17,827; Argentina 10,000. |
| Magnesite | 16 | 32 | West Germany 14; Italy 14; Netherlands 3. |
| Mica: | | | |
| Crude, including splittings and waste | (1) | 10 | Mainly from Denmark. |
| Worked, including agglomerated splittings | 27 | 34 | Switzerland 16; United States 14; France 3. |
| Phosphorus, elemental | 104 | 97 | West Germany 48; United Kingdom 33. |
| Pigments, mineral, including processed iron oxides | 2,336 | 2,522 | West Germany 2,036; Spain 248; Argentina 135. |
| Precious and semiprecious stones, except diamond[3] kilograms | 1,242 | 1,364 | West Germany 647; India 270; Switzerland 201. |
| Pyrite, gross weight | 126 | 106 | West Germany 56; United States 50. |
| Salt and brine | 28 | 45 | West Germany 31; United Kingdom 13. |
| Sodium and potassium compounds, ne.s.: | | | |
| Caustic soda | r 211,128 | 262,442 | United States 125,503; France 32,316; Netherlands 29,273. |
| Caustic potash, sodic and potassic peroxides | r 1,821 | 3,337 | France 1,035; Untied States 848; East Germany 615. |
| Sodium carbonate (soda ash) | 22,582 | 43,022 | Romania 19,094; United Kingdom 12,915; France 6,960. |
| Sodium sulfate | 55,136 | 71,506 | Mexico 48,076; Sweden 20,350; Chile 2,800. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous | 1,069 | 6,428 | Paraguay 6,087; Italy 290. |
| Other | 101 | 79 | Mainly from Argentina. |
| Worked | 47 | 159 | Italy 75; West Germany 71; Japan 8. |
| Dolomite, chiefly refractory grade | 1,917 | 2,500 | Mainly from Italy. |
| Gravel and crushed rock | 475 | 215 | France 107; United States 105. |
| Limestone (except dimension) | 2,000 | -- | |

See footnotes at end of table.

## Table 3.—Brazil: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel—Continued | | | |
| Quartz and quartzite | 218 | 380 | West Germany 211; United States 68; Spain 50. |
| Other | 780 | 1,492 | United States 1,419; Belgium-Luxembourg 70. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 372,686 | 455,337 | United States 233,966; Canada 150,017; Mexico 34,571. |
| Colloidal | 172 | 237 | United States 211; West Germany 25. |
| Sulfur dioxide | 2 | 46 | West Germany 42; United States 2. |
| Sulfuric acid, oleum | 6,305 | 66,353 | Norway 64,825; Portugal 1,485. |
| Talc, steatite, soapstone, pyrophyllite | 90 | 177 | United States 116; West Germany 35; Norway 25. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Meerschaum | 120 | (1) | All from Italy. |
| Other | (1) | 50 | West Germany 42; United States 4. |
| Slag, dross, and similar waste, not metal bearing | 70 | 1,752 | Canada 1,012; West Germany 740. |
| Oxides and hydroxides of magnesium, strontium, and barium | 739 | 2,436 | Japan 1,589; United States 594; West Germany 106. |
| Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s | 23 | 60 | United Kingdom 56; Norway 3. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 733 | 1,011 | United States 716; Spain 200; Trinidad and Tobago 60. |
| Carbon black | 8,368 | 19,141 | United States 8,016; Argentina 4,773; Italy 2,188. |
| Coal, all grades, including briquets thousand tons | 1,862 | 1,700 | United States 1,508; Poland 189. |
| Coke and semicoke | 186,739 | 122,353 | West Germany 89,274; Belgium-Luxembourg 13,007; Italy 7,887. |
| Hydrogen and rare gases | 9 | 16 | United States 7; France 6. |
| Peat, including peat briquet and litter | 19,960 | 13 | West Germany 11; Finland 2. |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 169,358 | 236,304 | Saudi Arabia 106,661; Iraq 56,876; Kuwait 23,961. |
| Refinery products: | | | |
| Gasoline do | 929 | 2,151 | Netherlands Antilles 1,103; Trinidad and Tobago 296; Puerto Rico 260. |
| Kerosine do | 185 | 193 | Greece 160; Netherlands Antilles 33. |
| Distillate fuel oil do | -- | 187 | Romania 143; Algeria 44. |
| Residual fuel oil do | 563 | 631 | United States 342; Venezuela 289. |
| Lubricants (including grease) do | 2,519 | 2,901 | United States 1,773; Netherlands Antilles 630; Trinidad and Tobago 252. |
| Other: | | | |
| Liquefied petroleum gas do | 4,223 | 1,815 | Venezuela 985; Libya 209; Netherlands Antilles 194. |
| Naphtha do | r 10,787 | 10,524 | Saudi Arabia 3,647; Kuwait 3,120; Trinidad and Tobago 1,622. |
| Mineral jelly and wax do | 76 | 68 | East Germany 26; Japan 11; Argentina 10. |
| Bitumen and other residues, and bituminous mixtures, n.e.s do | 132 | 113 | Mainly from United States. |
| Pitch, pitch coke, petroleum coke do | 386 | 340 | United States 322; United Kingdom 11; Belgium-Luxembourg 6. |
| Other do | 131 | 72 | United States 67; West Germany 4. |
| Total do | 19,931 | 18,995 | |
| Mineral tar and other coal, petroleum-, or gas-derived crude chemicals | r 127,379 | 133,008 | United States 59,834; Venezuela 36,789; Netherlands Antilles 34,495. |

r Revised.

1 Less than ½ unit.

2 Partial figure; quantity reported valued at $420,609 in 1972 and $651,654 in 1973. Total imports include unspecified quantities valued at $52,020 in 1972 and $5,362 in 1973.

3 Partial figure; quantity reported valued at $321,720 in 1972 and $507,763 in 1973. Total imports include unspecified quantities valued at $46,823 in 1972 and $52,483 in 1973.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Early in 1974 a $50 million program was announced for the purpose of increasing the capacity of the refinery and smelter of Companhia Mineira de Alumínio (ALCOMINAS) at Poços de Caldas, Minas Gerais. The company, jointly owned by Aluminum Co. of America, M. A. Hanna Mining Co., and Brazilian interests, will enlarge its facilities to produce 140,000 tons of alumina and 64,000 tons of metal annually.

Companhia Brasileira de Alumínio (CBA) also won state financing to expand production at its plant near São Paulo. The 75% expansion will increase company production to 406,000 tons of bauxite, 156,500 tons of alumina, and 70,000 tons of aluminum annually by 1976.

Plans for the exploitation of the Oriximina bauxite deposit in the Trombetas area were being developed by Mineração Rio do Norte S.A., a company organized by CVRD, Alcan Aluminium Ltd., and eight other companies. A mine, an alumina plant, a smelter, and a hydroelectric power installation were to be included. Completion was anticipated by 1980, at which time the annual production levels were expected to be 5.2 million tons of bauxite, 2 million tons of alumina, and 700,000 tons of primary metal.

Late in 1974, a separate company, Alumínio do Brasil S.A. (ALBRAS), was organized to plan and build the smelter and powerplant. The smelter, of 640,000 tons capacity, was to be built at Vila do Conde, near Belém. The powerplant, which will provide 3 million kilowatts, was to be built at Tucuruí on the Tocantins River; the smelter will require 1.2 million kilowatts at full capacity.

Kaiser Aluminum & Chemical Corporation sold its Brazilian subsidiary, Kaiser Alumínio do Brasil, jointly to Mitsui Mining & Smelting Co. and Surukawa Electric Co.

Alcan Alumínio do Brasil S.A. began building a second cold-rolling unit for aluminum sheet at its fabricating plant at Utinga, Bahia. When the new unit is in production, about mid-1976, it will double the plant's production of sheet, now 25,000 tons per year.

**Columbium.**—Brasimet Comercio e Industria, S.A., a subsidiary of South American Consolidated Enterprises of the Hochschild group, began development of the Catalão pyrochlore deposit, including construction of a 1,000-ton-per-day mill.

Companhia Brasileira de Metalurgia e Mineração announced plans to expand its production of pyrochlore concentrate from 21,500 tons per year to 30,000. The new capacity will come onstream at the end of 1976.

**Copper.**—Caraíba Metais S.A., invited the cooperation of Corporacíon del Cobre (CODELCO) of Chile in a joint venture to develop and operate the Caraíba deposit in Bahia.

Companhia Pesquisas de Recursos Minerais (CPRM), a government corporation, announced plans to leach copper ore in Rio Grande do Sul.

**Iron Ore.**—Final figures showed a 29% increase in production over that of 1973. Total shipments recorded reached 70.3 million tons, but this figure does not include production for Companhia Siderúrgica Nacional (CSN) at the Casa da Pedra and other mines. Exports were estimated at 57.4 million tons, a 32% increase.

CVRD continued to construct increased production capacity of various types. Open pit mine production was being expanded, with consequent addition of crushing, grinding, sizing, and magnetic concentration units. The 525-mile narrow-gage railroad from Itabira to Tubarão was being double-tracked; eventual capacity of 100 million tons per year is planned. Trains consisted of 160 cars of 72-ton capacity, but longer trains will be moved in the future. At Tubarão, facilities for car dumping, sizing, stockpiling, and ship loading were being added.

CVRD drew ore from three mines during the year: Caue, Conceicão, and Picarrão. Reserves at Caue were estimated at 450 million tons of 67% iron and an additional 650 million tons of 50% iron. Reserves at Conceicão were 600 million tons of high-grade ore and 800 million tons of milling-grade ore.

Amazonia Mineração S.A. (AMZA), owned 51% by CVRD and 49% by United States Steel Corp., continued development and equipping of the iron deposit of the Serra dos Carajás, in Pará, 250 miles southwest of Belém. A 600-mile railroad from

the mine to Ponta de Madeira, Maranhão, will be built to bring the ores to tidewater. First production is expected in 1978, and a maximum annual output of 50 million tons is expected by 1983.

CVRD and Companhia Aços Especiais Itabira (ACESITA) have formed a new company, Cia. Itavale, to mine iron ore from the Itabira area at Periquito, Onça, and Esmeril. Feasibility studies were underway. A production scale of 20 million to 25 million tons annually is planned.

Minerações Brasileiras Reunidas S.A. (MBR), owned 51% by Empreendimentos Brasileiros de Mineração, S.A., and 49% by St. John d'El Rey Mining Co. Ltd., a subsidiary of the M.A. Hanna Mining Co., shipped an estimated 8 million tons of ore from the Aguas Claras mine to its loading facilities at Sepetiba Bay. From this port most of the ore was shipped to Japan.

CSN, Brazil's government-owned steel producer, has contracted with Kaiser Engineers for the expansion of its Casa da Pedra iron mine, near Belo Horizonte, to 7 million tons annually. Completion is scheduled for mid-1976.

**Iron and Steel.**—Brazilian production of pig iron, steel ingot, and rolled steel products continued to increase during the year, by 5.7%, 5.0%, and 1.5%, respectively. A 10% increase had been programed; the shortfall was due to shortages of coking coal, most of which must be imported. The rate of delivery of coal by U.S. exporters in fulfillment of contracts was about 45% at yearend. Ingot production declined 11% at both CSN and Usinas Siderúrgicas de Minas Gerais, S.A. (USIMINAS), while production by Companhia Siderúrgica Paulista (COSIPA) was 23% greater than in 1973. Output of flat-rolled products, principally from these three mills, declined 7.3%, while output of nonflat shapes, mostly by the private sector, gained 9.7%.

Demand for steel in Brazil rose abruptly to a reported 12.2 million tons, thus increasing imports of steel from 2.6 million tons in 1973 to 4.7 million tons in 1974.

Siderúrgica Brasileira, S.A. (SIDERBRAS), the Government corporation which has the controlling share in CSN, COSIPA, and USIMINAS, at yearend was preparing to enter into capital participation in the private sector on a minority basis. SIDERBRAS was also authorized to negotiate for foreign coal supplies for Brazil's steel mills.

Kawasaki Steel Corporation and four other Japanese companies acquired a 99% interest in Minas do Serra Geral, S.A., which owns mines at Capanema, Minas Gerais. Studies were begun on the feasibility of annual production of 6 million tons beginning in 1977. The ore is intended for domestic consumption.

An estimated reserve of 400 million tons of high-grade ore was indicated at a deposit near the Xingu River in Pará, north of the Carajás area. The Antunes group was seeking a concession to develop the ore.

CVRD contracted to build a pelletizing plant of 4 million tons annual capacity in Brazil, at a cost of $120 million, $84 million of which is to be from an Egyptian source. The contract also provides for CVRD, along with Japanese and West German interests, to invest $4 million in a 1.6 million-ton-per-year direct-reduction iron plant near Alexandria, Egypt. The Egyptian General Organization for Industry will receive 3.6 million tons of pellets for use as feed to the sponge iron plant.

A newly formed company, Cia. Nippo-Brasileira de Peletização, owned 51% by CVRD and 49% by Nippon Steel Corporation and five other Japanese companies, will build two pellet plants, of 3 million tons total annual capacity, at Tubarão; the product is intended for export to Japan. MBR also was reportedly considering pellet plant construction, in this case near its loading docks at Sepetiba Bay.

Conselho Consultivo da Indústria Nacional de Siderúgica (CONSIDER), was constituted supervisor of a type of enterprise of recent appearance in Brazil—corporations with an international equity mix strongly oriented toward export trade. CONSIDER's authority to approve government financial assistance to steel projects remained unchanged. Expansion projects approved during the year included—

1. Increase in ingot capacity at CSN, COSIPA, and USIMINAS to 4.6 million, 3.5 million, and 3.5 million tons per year, respectively.

2. Expansion of capacity at ACESITA to an annual production of 614,000 tons of special steels.

3. Increases of various types of capacity at Cia. Ferro e Aço de Vitória, Companhia Siderúrgica Mannesmann, and Siderúrgica Fi-El Korff S.A.

4. Construction of a new 3-million-ton-per-year steel works on tidewater at Tubarão, Espírito Santo.

The Tubarão plant will be the first new Brazilian steel mill; the plant will have annual capacity of 3 million ingot tons by 1977, and it may expand to twice that figure by 1980. SIDERBRAS will provide 51% of the capital, while Kawasaki Steel and Finsider International, S.A., will share the remainder equally. The first stage of construction will include a blast furnace, two basic oxygen furnaces, and a slab mill.

In planning for a steel complex to be built at Itaqui, Maranhão, the present partners, SIDERBRAS and Nippon Steel, were seeking additional foreign participants and a reliable supply of coking coal. The Itaqui plant will depend on iron ore from Carajás; some degree of coordination is implicit.

The International Finance Corp. announced a loan of $60 million and a $4.5 million equity subscription to Companhia Siderúrgica da Guanabara (COSIGUA), to enable that company to increase its production, mainly of reinforcing bars and wire rod, to 480,000 tons by 1976. COSIGUA is scrap based, but the loan will be used in part to build a direct-reduction facility to reduce the company's dependence on increasingly scarce and expensive scrap.

The Export-Import Bank and the First National City Bank of New York have each authorized a loan of $1.06 million to ACESITA to finance purchase of a Sendzimir cold-rolling mill.

Late in 1974, the direct-reduction plant of Usina Siderúrgica da Bahia (USIBA) was inaugurated. USIBA and Aços Finos de Piratini, also a direct-reduction facility, produced 143,000 tons of sponge iron in 1974 and are expected to make 350,000 tons in 1975.

In March the Brazilian Government requested an increase in scrap export allocations from the United States.

The Association of Brazilian Ferroalloy Producers described the supply situation as "near self-sufficiency" and considered exports possible in the near future. Seventeen companies operating 40 furnaces reported a total annual capacity of 243,000 tons. Industry leaders are ALBRAS and Eletrosiderúrgica Brasileira, S.A., each accounting for 18% of the total capacity. Demand for 1974 was estimated at 182,500 tons.

**Nickel.**—For several years Baminco Mineração e Siderúrgia S.A., a company controlled by Metallgesellschaft AG and Exploration und Bergbau, GmbH, has conducted geological and metallurgical investigations into the lateritic nickel deposits at Barro Alto, Goiás. In 1974, International Nickel Co. of Canada Ltd. (INCO) entered into a participatory agreement with Baminco. The feasibility studies will be continued and expanded; a bulk sample will be shipped to INCO's pilot plant at Port Colborne, Ontario.

**Tin.**—Mineração Brumadinho Ltda., reported that mining began in January at the São Lourenço mine, which produced 50 tons of cassiterite monthly for the rest of the year. Production from the Alto Candeias property was expected early in 1975, as was the startup of the Cachoerinha mine. The Oriente Novo mine produced 1,500 tons of concentrate during the year.

Exploration has revealed large tin reserves in central Goiás. Production at the Serra Branco mine in Goiás was interrupted by heavy rains and flooding.

**Titanium.**—A large body of ilmenite was discovered near Aripuanã, in northwestern Mato Grosso. While the ore appears to be of good grade, lack of transportation makes early exploitation doubtful.

CVRD reported that feasibility studies and further geological investigations into the Tapira anatase deposit were proceeding. If warranted by the results of the studies, a pilot plant will be installed.

**Uranium.**—The Comissão Nacional de Energia Nuclear (CNEN) reported on Brazil's uranium reserves. The Poços de Caldas area, Minas Gerais, contains 3,940 tons of measured and 5,100 tons of probable uranium oxide ($U_3O_8$). The Figueira deposits in Paraná have 2,000 tons of $U_3O_8$ in ore of a 0.15% grade, and 4,000 tons more in ore of 0.04% grade. In addition, lower grade resources associated with carbonatites at Araxá, Minas Gerais, and the phosphate rock at Olinda, Pernambuco, contain 170,000 tons of the oxide.

## NONMETALS

**Cement.**—Production in 1974 was 11.4% greater than in 1973, exceeding the planned goals. Nevertheless, demand was significantly greater than production. Officials responsible for highway construction and other civil works reported acute local

shortages. One large producer shut down to correct unexpected technical difficulties.

Companhia de Cimento Portland Alvorada obtained a government loan to expand production at its Cimento Paraíso works, Rio de Janeiro.

**Fertilizer Materials.**—Demand for fertilizers in Brazil, which has been escalating sharply in recent years, was slightly less than 2 million tons in 1973. About 71% of the 1973 demand was met with imports. A world shortage and consequent high prices in 1974 caused an increased drain on Brazil's foreign exchange. In November public and private agencies announced planned expenditures of $1.35 billion over a 5-year period to make Brazil self-sufficient in all three fertilizer materials.

Nitrogenous fertilizers began to be produced in Brazil in 1970. Three plants produced 350 to 400 tons of these materials per day during 1974. Two of the plants, at Cubatão, São Paulo, and Camacari, Bahia, were subsidiaries of Petróleo Brasileiro S.A. (PETROBRAS). The third producer, with a plant at Cubatão, was Ultra Fertil, S.A., a subsidiary of Phillips Petroleum Corp. until midyear, when Phillips sold its 79% share to PETROQUISA.

In November the Government announced plans to invest substantially in construction of a plant to make ammonia and urea in Sérgipe, where natural gas production was not being fully used. The plant, jointly funded by PETROQUISA and Mitsui & Co., Ltd., will duplicate facilities now operating at Camaçari, Bahia, where 200 tons of ammonia and 250 tons of urea are made each day. Feedstock will come from the adjacent Mataripe oil refinery. The joint venture, Amonio Fosfatos de Nordeste, S.A., will produce and market ammonium phosphate fertilizers.

Phosphate rock was mined at Olinda, Pernambuco, until 1968 when transportation costs became excessive. Brazil's phosphate in 1974 came from an apatite deposit at Jacupiranga, São Paulo, and was mined by Serrana de Mineração S.A. Araxá S.A. Fertilizantes and Agrofertil S.A. Ind. e Com. de Fertilizantes were formed recently to produce phosphates at Araxá, Minas Gerais, and Maceío, Alagoas, but production is still a year or two in the future. Nearing production is the phosphoric acid plant of Companhia Riograndense de Adubos; construction began in 1973 in the State of Rio Grande do Sul. Beker Industries, Inc., announced its intention to build a fertilizer plant and a phosphoric acid plant in Brazil, using raw materials from the United States; the plants were to be onstream by 1977. The Monsanto Co. expected to have a similar installation in operation at São Jose dos Campos, São Paulo, early in 1976; source of the raw material was not specified.

In November, Comminerium Mineração S.A., and PETROBRAS, through its subsidiary PETROQUISA, became equal and sole stockholders in Kalium Mineração, S.A., a company which was awarded the contract to develop the potassium salt deposit at Carmópolis, Sergipe. The salt beds, discovered in 1965 in the course of drilling an oil well, were extensive, but presented the problem of mining the salt without adversely affecting production of oil and gas from adjacent areas.

A joint company was formed by representatives of Brazil, Iran, and Senegal to develop phosphate deposits in Senegal. Production is scheduled for late 1976; the product will be exported to Brazil at the rate of 2 million tons per year.

**Fluorine.**—Companhia Nitro Quimíca Brasileira placed contracts for construction of facilities to produce 8,500 tons of hydrofluoric acid, 6,000 tons of aluminum fluoride, and 6,000 tons of cryolite annually. The complex, at São Miguel, São Paulo, was to be completed by the end of 1975.

**Quartz.**—On August 29, a communication from Carteira de Comercio Exterior do Banco do Brasil (CACEX) temporarily prohibited the export of quartz, effective September 15. The order included both quartz crystal and lasca. The step was apparently taken because of irregularities in exporting procedures, and the National Council of Foreign Trade was studying the situation. Trade was resumed on September 26, but CACEX imposed the regulation that lasca in pieces of 200 grams or less may not be exported at less than $3.50 per pound, regardless of grade, and limited exports to 600 tons for the last quarter of 1974.

Both points upset the market; the floor price was much greater than the previous U.S. price of lasca, which averaged 20 to 30 cents per pound, and the export quota at 200 tons per month was less than former imports by the U.S. alone—263 tons per

month in 1972. CACEX also established floor prices for quartz crystal, although no quota was set. These actions were officially explained on the basis of Brazil's wish to foster domestic processing of quartz, both natural and fused. In further support of this intention on October 11 the Bank of Brazil began collecting a 10% ad valorem export tax on lasca; the proceeds were earmarked for a fund for industrial and technological development of quartz.

In November CACEX published a tabulation showing minimum export price levels for the three piezoelectric grades of lasca, by weight of fragment. Minimum price levels for export of jewelry grade were set at $7 to $20 per kilogram, depending on weight.

A company, Xtal, Ltda., was formed to process quartz for electronic use. Joint venture funding was being sought outside Brazil.

During 1975, exports of lasca were to be limited to 3,500 tons at floor prices of $1.60, $3.50, and $6 per kilogram, respectively, for the three grades.

**Sodium and Sodium Compounds.**—Carbocloro S.A. Industrias Quimícas, a subsidiary of Diamond Shamrock Co., was again the largest producer in Brazil; annual output since 1971 has been about 110,000 tons of caustic soda and 96,000 tons of chlorine. Early in the year The Dow Chemical Co. announced plans, approved by the Brazilian Government, to build a 150,000-ton-per-year chlor-alkali complex at Aratu, on the Bahia coast. The Ministry of Industry and Commerce authorized private companies to import soda ash, a right previously assigned solely to Companhia Nacional de Alcalis (CNA). CNA announced an expansion of its plant at Cabo Frio, Rio de Janeiro, and a new soda ash plant will be built at Macau, Rio Grande do Norte.

**Stone.**—CSN contracted with Kaiser Engineers for development of the Arcos limestone deposit in Minas Gerais. The mine is to produce 2.6 million tons annually, to be used in CSN's iron and steel plants at Volta Redonda, beginning in mid-1975.

## MINERAL FUELS

**Carbon Black.**—About midyear Phillips Petroleum sold its major Brazilian interests, but retained a 50% holding in Cia. de Carbonos Coloidais. This company's plant produced over 40,000 tons 1974, and was expanding its facilities to make 75,000 tons by 1976.

Financing has been obtained for the formation of Capuava Carbonos Industrias, Ltda., a joint venture of União de Industrias Petroquímicas S.A., and Cabot Corp. The new company will build an $11 million carbon black facility at Capuava.

**Coal.**—Discussion between the Brazilian and Colombian Governments, begun in 1973, continued in 1974. The tentative agreement provides for formation of a joint company to develop Colombian coal resources, export of the coal to Brazil, and export of Brazilian steel to Colombia in payment for the coal.

In March, heavy rains and flooding caused 9 of the 11 coal mines in Santa Catarina to suspend production.

Brazilian steelmakers became increasingly concerned during the year at the declining rate of delivery of U.S. coking coal to Brazil. A 30% shortfall by mid-August, in addition to reduced shipments of domestic coal because of floods, reduced steel companies'' inventories to a precariously low level. Later figures covering the period January to November showed 1,799,500 tons contracted, 798,360 tons received, and 45% delivery, for CSN, USIMINAS, and COSIPA; contracts and receipts by smaller steel companies may alter these totals.

The U.S. coal companies declared force majeure on the basis of labor troubles and material shortages. Higher priced spot sales increased during the year, but most were attributed to entry of small and marginal mines into the market. Worldwide demand for coal, and pricing thereof, increased as a result of the Arab oil embargo. No solution to the problem had been advanced by by yearend.

**Natural Gas.**—Despite some local Bolivian opposition, the agreement between Bolivia and Brazil for the export of Bolivian natural gas to Brazil was concluded in May. The agreement provided that (1) Bolivia will sell a minimum of 240 million cubic feet of gas to Brazil, (2) Brazil will provide financial and technical help to set up a steel plant at Puerto Suarez, a 1,000-ton-per-day nitrogenous fertilizer plant, and a 1,000-ton-per-day cement plant, and (3)

Brazil will buy 105,000 tons of sponge iron and 100,000 tons of bar and rod annually from the steel plant beginning in 1978. Brazil will double this rate of purchase in 1981, will buy 100,000 to 200,000 tons of urea per year, and will buy up to half the production of the cement plant.

Natural gas production, at 1.5 billion cubic meters, was 26% greater than in 1973. Reserves were estimated at 26.261 billion cubic meters as of December 31, an increase of 1.5% during the year.

**Petroleum.**—Production of crude petroleum was 4.2% greater than in 1973. Of the daily average production of 177,500 barrels, 9.5% originated in offshore wells. Bahia contributed 72% of total production, and Sergipe another 15%. Imports of petroleum and petroleum products cost Brazil $3.4 billion during the year, offset by only $0.3 billion in exports. Apparent consumption was 8% greater than in 1973, reaching 827,000 barrels per day. Reserves were estimated at 779 million barrels at yearend.

Exploration data for 1974 are summarized as follows:

| | Land | Offshore | Total |
|---|---|---|---|
| Drill rigs | 22 | 17 | 39 |
| Drill-months | 212.8 | 160.2 | 373.0 |
| Holes drilled | 132 | 52 | 184 |
| Length of holes drilled thousand meters | 197 | 168 | 365 |

New fields discovered in 1973 were Robalo and Camorim, off the shore of Sergipe, and Ubarana, off the shore of Rio Grande do Norte. A second hole drilled in 1974 in the Robalo Field penetrated two petroleum and four natural gas horizons, all between 2,100 and 2,300 meters. In 1974, discoveries were made at the Mero Field, off the coast of Alagoas; at the mouth of the Vasa-Barris River in Sergipe; and in the Garoupa and Pargo Fields off the coast of Rio de Janeiro. The Mero well is expected to produce 12,000 barrels of petroleum and 400,000 cubic meters of natural gas daily when it comes into production in 1976.

During the year, seismographic, aeromagnetic, and in some cases photogeologic surveys were conducted in Acre, central Amazonas, Rio Grande do Norte, Sergipe, Alagoas, southern Bahia, Espírito Santo, Paraná, and the Reconcavo Basin, and along the entire Continental Shelf.

Refinery throughput came to 785,800 barrels per day, 8% more than in 1973. The Paulínia plant completed its new distillation unit of 125,800 barrels per day capacity, which was in production during the last quarter. The Mataripe plant increased its production capacity for asphalt, and continued work toward expanding its production of lubricating oils. Construction of the two new refineries, Araúcaria (125,800 barrels per day) and São José de Campos (188,700 barrels per day), continued throughout the year. PETROBRAS announced plans to build a large marine oil terminal at Ilha Grande, Rio de Janeiro.

PETROBRAS and the U.S.S.R. signed a contract for 3.7 million barrels to be supplied to Brazil during the last 5 months of 1974. The oil will be carried in PETROBRAS tankers.

Brazil signed a 30-year contract with Libya for oil exploration over a 20,000-square-kilometer area south of Tripoli. Brazil expects to spend $35 million during the first 5 years.

The prototype plant continued its 3-year (1973–75) program to determine the economics of oil production from schists by the PETROSIX process. The plant, at Irati, Paraná, was producing 1,000 barrels daily at a cost of $6 to $7 per barrel. Commercial production is expected by 1979. Crude oil reserves in the Irati schist were estimated at 800 billion barrels. Geologic mapping of the Irati formation and reconnaissance of schists and shales in the northern and northwestern States continued.

# The Mineral Industry of Bulgaria

By Nikita Wells [1]

Performance of the Bulgarian economy, in the fourth year of its sixth 5-year plan (1971–75) was varied, and unlike previous years, the rates of growth in major economic sectors slowed. According to Bulgarian sources, industrial production and national income increased 8.5% and 7.5%, respectively, well below the initially planned figures of 11% and 10%. Capital investments dropped from 4.3 billion leva [2] in 1973 to 3.9 billion leva in 1974, much below the 1974 planned figure of 4.5 billion leva. Instead of the planned 34%, only 27.5% of the 3.9 billion leva went toward reconstruction and modernization.

Labor productivity for industry was reported to have increased 6% in 1974, accounting for almost three-fourths of the 8.5% increase in industrial production. The greatest achievements were reported in the chemical industry which registered an increase of 14.5%, and in the machine-building and metal processing industry which increased by 13.6%. The corresponding planned targets, however, were 27% and 21%, respectively.

Production of electric energy increased 3.9%, the increase being somewhat disappointing considering the effort applied to expansion of power production capacities. The production of the mineral fuels (coal, crude oil, and natural gas) fell considerably below the 1973 levels. Output of crude steel, iron ore, and pig iron fell slightly below that of 1973. The production of construction materials increased by 9%.

Bulgaria's chief industrial problems were labor shortages and low labor productivity, obsolete plants and equipment, unused production capacity, uneconomic transportation, and poor management. The mining industry in Bulgaria in general is characterized by low-grade ores and lower rank lignitic coals.

On the positive side, however, 1974 marked several cornerstones in Bulgarian economic development. In July, Bulgaria's first nuclear powerplant at Kozloduy began operation. In the same month construction of the Bulgarian section of the natural gas pipeline from the U.S.S.R. was completed and the first Soviet natural gas deliveries began. In June, a Bulgarian-Soviet Union agreement was signed denoting Bulgaria's participation in the construction of the Orenburg gas pipeline for which Bulgaria will receive yearly deliveries of natural gas. A new cold-rolling mill came into operation at the Kremikovtsi metallurgical complex during 1974. An agreement was also signed with the Soviet Union for Bulgarian participation in the construction of one of the largest steel mills in the U.S.S.R.

In the nonmetallic industry, the compound fertilizer complex at Devnya began operating during 1974 and thus increased the production of phosphatic fertilizers markedly. An agreement was also signed during the year with the U.S.S.R. for Bulgaria's participation in the construction of a phosphatic fertilizer plant in the U.S.S.R.

Bulgaria will continue its policy of integration with the U.S.S.R. and the other COMECON [3] countries which have claimed

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[1] Physical scientist, International Data and Analysis.

[2] Because of fluctuating exchange rates, a meaningful conversion to U.S. currency is impractical. Therefore, expenditures are reported in leva and are not converted. Exchange rate June 1975: 1 leva = US$1.03 = 0.71 rubles (U.S.S.R.).

[3] COMECON (CMEA) Council of Mutual Economic Assistance comprising the following countries: Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the U.S.S.R.

70% of Bulgaria's foreign trade in 1974. Trade with the West will probably increase as Bulgaria looks for new equipment and assistance not available within the COMECON community.

## PRODUCTION

The iron and steel industry continued to experience serious problems in 1974 as evidenced by decreases of 2.6% in crude steel production, 3.2% in iron ore, and 5.1% in pig iron from that of 1973. No major developments were reported in the nonferrous metal sector. Copper mine output increased 7.5% and lead production increased by 4.8% over that of 1973.

In the nonmetallic industry the only sizable increase in production during 1974 appeared in phosphatic fertilizers (39% over that of 1973). This was due to the start of operations of the compound fertilizer complex at Devnya. Small increases were also seen in the production of asbestos, cement, kaolin, lime, and nitrogen fertilizers.

Production of mineral fuels showed disappointing results and continued a downward trend. For 1974, as compared with 1973, the production of coal decreased by 9%, crude oil by 24%, and natural gas by 19%.

Output of electricity in 1974 reached 22.8 billion kilowatt-hours, a 3.9% increase over that of 1973. This increase is relatively small since Bulgaria has been trying to expand its electric power production capacities and probably will not be able to meet the target of 30 billion kilowatt-hours by yearend 1975.[4]

[4] Rabotnichesko Delo (Labor Review), Sofia, Feb. 1, 1975.

**Table 1.—Bulgaria: Production of mineral commodities**
(Thousand metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| METALS | | | |
| Cadmium, smelter output [e] ---- metric tons -- | 200 | 200 | 200 |
| Copper: | | | |
| Mine output, metal content ---- do ---- | 45,000 | [r e] 48,000 | 51,600 |
| Blister including secondary ---- do ---- | 48,000 | [r e] 53,000 | [e] 55,000 |
| Refined electrolytic, including secondary [e] ---- do ---- | [r] 45,000 | [r] 48,000 | 48,000 |
| Iron and steel: | | | |
| Iron ore and concentrate ---- | 3,207 | 2,774 | 2,685 |
| Pig iron including blast furnace ferroalloys ---- | 1,562 | 1,610 | 1,528 |
| Crude steel ---- | [r] 2,121 | 2,246 | 2,188 |
| Semimanufactures ---- | 2,024 | 2,098 | 2,242 |
| Lead: | | | |
| Mine output, metal content [e] ---- metric tons -- | [r] 102,000 | [r] 105,000 | 110,000 |
| Smelter including secondary [e] ---- do ---- | [r] 104,000 | [r] 107,000 | 112,000 |
| Manganese: | | | |
| Gross weight ---- | 30 | 38 | 34 |
| Metal content ---- | 9 | 11 | 10 |
| Molybdenum mine output, metal content [e] -- metric tons -- | 140 | 140 | 140 |
| Zinc: | | | |
| Mine output, metal content [e] ---- do ---- | 80,000 | 80,000 | 84,000 |
| Smelter including secondary [e] ---- do ---- | 80,000 | 80,000 | 80,000 |
| NONMETALS | | | |
| Asbestos ---- do ---- | 1,500 | 600 | 700 |
| Cement, hydraulic ---- | 3,910 | 4,178 | 4,297 |
| Clays, kaolin ---- | 142 | 185 | 210 |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous: | | | |
| Gross weight ---- | 1,416 | 1,412 | 1,432 |
| Nitrogen content ---- | 523 | 519 | 525 |
| Phosphatic: | | | |
| Gross weight ---- | 396 | 408 | 570 |
| Phosphorus pentoxide content ---- | 130 | 135 | 188 |
| Gypsum and anhydrite: | | | |
| Crude ---- | 171 | 200 | 246 |
| Calcined ---- | 28 | 37 | 42 |
| Lime (quicklime) ---- | 950 | 919 | 1,312 |
| Pyrite, gross weight [e] ---- | 150 | 150 | 150 |
| Salt, all types ---- | 104 | 74 | 130 |
| Sulfur, elemental ---- | 174 | 180 | 185 |

See footnotes at end of table.

**Table 1.—Bulgaria: Production of mineral commodities—Continued**
(Thousand metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Coal (marketable): | | | | |
| Anthracite | | 155 | 128 | 117 |
| Bituminous | | 229 | 223 | 190 |
| Lignite and brown | | 26,894 | 26,459 | 23,998 |
| Total | | 27,278 | 26,810 | 24,305 |
| Coke | | 1,190 | 1,231 | 1,308 |
| Natural gas, marketed production | million cubic feet | [r] 7,790 | 7,848 | 6,360 |
| Petroleum: | | | | |
| Crude oil: | | | | |
| As reported | | 248 | 190 | 144 |
| Converted | thousand 42-gallon barrels | 1,810 | 1,387 | 1,051 |
| Refinery products: | | | | |
| Gasoline | do | [e] 11,475 | 12,750 | 13,175 |
| Kerosine | do | 1,124 | 1,162 | 1,240 |
| Distillate fuel oil | do | [e] 17,770 | 19,806 | 21,634 |
| Residual fuel oil | do | [r] 26,640 | 30,902 | 32,301 |
| Lubricants | do | 455 | 490 | 490 |
| Asphalt including natural | do | 1,200 | 1,491 | 1,666 |
| Total | do | 58,664 | 66,601 | 70,506 |

[e] Estimate. [p] Preliminary. [r] Revised.
[1] In addition to the commodities listed, bismuth, chromite, gold, silver, barite, fluorspar, magnesite, palladium, platinum, tellurium and uranium are also produced, but information is inadequate to make reliable estimates of output levels.

## TRADE

The value of Bulgaria's foreign trade turnover for 1974 was 7,917 million leva, showing a 24% improvement over 1973. Exports were reported to reach 3,721 million leva and imports 4,196 million leva. Trade with centrally planned economy countries amounted to 72.9% of total trade while trade with developed countries was 17.4% and with developing countries 9.7%.[5]

The volume of trade between Bulgaria and the U.S.S.R. in 1974 exceeded 3,948 million leva, showing a 10% increase over that of 3,948 million leva, showing a 10% increase over that of 1973 and accounting for approximately 50% of Bulgaria's foreign trade. In 1974, Bulgaria remained U.S.S.R.'s fourth most important trading partner.

In 1974, Bulgaria imported 6,205,000 tons of anthracite and bituminous coal of which 2,044,000 tons of anthracite and 3,741,000 tons of bituminous coal came from the U.S.S.R. Imported coke was 357,000 tons (294,000 tons from the U.S.S.R.) Almost all of the crude oil imported came from the U.S.S.R. and totaled 10,855,000 tons. The newly finished gas pipeline from the U.S.S.R. provided 307 million cubic meters of natural gas. Imports of iron ore totaled 2,396,000 tons (1,962,000 tons from the U.S.S.R.) and pig iron imports were 340,000 tons (318,000 tons from the U.S.S.R.). In addition, 34,300 tons ($P_2O_5$ content) of phosphatic fertilizers and 44,000 tons ($K_2O$ content) of potassium fertilizers were imported. Electric energy was imported from the Soviet Union and amounted to 3,645 million kilowatt-hours. Imports of nonferrous metals from the U.S.S.R. included 22,639 tons of aluminum and 16,243 tons of other nonspecified rolled nonferrous metals.

Bulgaria's exports of minerals and fuels in 1974 were very minimal and, in fact, showed a decrease from that of 1973 in most commodities except nitrogen fertilizers (69,200 tons, nitrogen content) and cement (143,000 tons). Other exports were 31,400 tons of sulfuric acid, 72,400 tons of bituminous coal, 5,800 tons of manganese ore, 290 tons of lead, and 4.1 million kilowatt-hours of electric energy.

Agreements have been signed between Bulgaria and the U.S.S.R. on cooperation in production of equipment for nuclear powerstations and in machine-building. Bulgaria is to supply machinery and equip-

[5] Statisticheskiy Yezhegodnik stran-chlenov Soveta Ekonomicheskoy Vzaimopomoshchi, 1975 (Statistical Yearbook of the COMECON countries, 1975). Moscow, 1975, p. 325.

ment worth 120 million leva for production plants in the U.S.S.R. and is to undertake certain kinds of construction on metallurgical projects.[6] In exchange, Bulgaria is to receive 1.12 million tons of iron ore concentrate and 9,000 tons of ferroalloys annually during the 1979–90 period.[7]

[6] Rabotnichesko Delo (Labor Review), Sofia, Dec. 21,, 1974.
[7] TASS, Moscow, Dec. 20, 1974.

**Table 2.—Bulgaria: Exports of selected mineral commodities [1]**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, unwrought and semimanufactures | 7,066 | 6,674 | Spain 3,982; Japan 2,692. |
| Cadmium metal, all forms | r 20 | 15 | All to Czechoslovakia. |
| Chromium oxide | 85 | NA | |
| Copper metal including alloys: | | | |
| Scrap | 401 | NA | |
| Unwrought and semimanufactures | r 3,814 | 4,432 | Yugoslavia 666; Belgium-Luxembourg 421. |
| Iron and steel: | | | |
| Scrap | r 34,480 | 45,911 | Italy 26,984; Spain 12,307; Poland 6,620. |
| Pig iron [2] | 30,700 | NA | |
| Ferroalloys | r 19,703 | 12,777 | Romania 8,800; Switzerland 1,732; Italy 1,656. |
| Steel, primary forms thousand tons | r 199 | 175 | Italy 94; Poland 29; West Germany 23. |
| Semimanufactures: [3] | | | |
| Bars, rods, sections do | r 132 | 153 | Yugoslavia 23; Italy 5; Spain 5. |
| Plates and sheets do | 703 | 531 | Italy 120; U.S.S.R. 92; West Germany 5. |
| Hoop and strip do | 4 | 4 | Italy 2; Yugoslavia 2. |
| Wire do | r 3 | 7 | Greece 4; Iran 1; Iraq 1. |
| Pipes and tubes do | r 71 | 95 | Poland 18; Romania 16; Yugoslavia 15. |
| Total do | r 913 | 790 | |
| Lead: | | | |
| Oxides | 1,531 | 887 | Italy 687; West Germany 200. |
| Metal including alloys, all forms | r 16,450 | 15,496 | Yugoslavia 6,792; Italy 5,194; Austria 1,963. |
| Scrap | 140 | NA | |
| Nickel including alloys: | | | |
| Scrap | 188 | NA | |
| Unwrought and semimanufactures | r 328 | 210 | Austria 122; Netherlands 88. |
| Magnesium | 88 | 75 | All to West Germany. |
| Silver metal including alloys, unworked and partly worked value, thousands | $2,238 | $2,136 | Japan $743; West Germany $651; Austria $578. |
| Zinc metal including alloys, all forms | r 29,627 | 28,776 | United Kingdom 7,373; Yugoslavia 4,843; France 4,427. |
| Other: | | | |
| Ash and residue containing nonferrous metals | 29 | NA | |
| Metals including alloys, all forms | r 131 | 4,932 | U.S.S.R. 4,298; West Germany 616. |
| NONMETALS | | | |
| Asbestos | 1,063 | 1,990 | All to Poland. |
| Barite | 74,300 | 261,900 | All to U.S.S.R. |
| Cement [2] thousand tons | 138 | 120 | Yugoslavia 62; Libya 45. |
| Clays and clay products: | | | |
| Crude clay, kaolin | 12,149 | 10,783 | Italy 7,499; Yugoslavia 3,284. |
| Products, nonrefractory | 31,401 | 43,187 | All to Yugoslavia. |
| Diamond, industrial value, thousands | NA | $61 | All to Belgium-Luxembourg. |
| Fertilizer materials: | | | |
| Manufactured, nitrogenous [2] | 131,092 | 153,701 | Yugoslavia 16,191; France 7,706; Greece 3,306. |
| Ammonia | 4,456 | 4,001 | All to Yugoslavia. |
| Sodium and potassium compounds: [2] | | | |
| Caustic soda | 2,000 | NA | |
| Soda ash | 59,058 | 23,606 | Hungary 8,916; U.S.S.R. 6,877. |
| Stone, dimension | 3,629 | 2,607 | All to West Germany. |
| Sulfur, sulfuric acid [2] | 25,246 | 37,316 | Romania 19,176; Yugoslavia 15,625. |
| Talc | 6,500 | 9,539 | All to U.S.S.R. |
| Other, crude, n.e.s | 12,853 | 12,971 | Austria 7,405; West Germany 5,566. |

See footnotes at end of table.

## Table 2.—Bulgaria: Exports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coke, metallurgical | 93,200 | 82,600 | All to Romania. |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 156 | 364 | Do. |
| Refinery products: | | | |
| Gasoline do | NA | 110 | All to Italy. |
| Distillate fuel oil [4] do | 49 | 28 | NA. |
| Residual fuel oil do | | | |
| Lubricants [2] do | r 109 | 160 | Poland 126; West Germany 28. |
| Other: | | | |
| Liquefied petroleum gas do | NA | 78 | All to Yugoslavia. |
| Mineral jelly and wax do | 2 | 8 | All to Spain. |
| Unspecified do | NA | 83 | West Germany 71; Yugoslavia 12. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | r 16,457 | 11,410 | All to Yugoslavia. |

r Revised. NA Not available.

[1] Compiled from official export statistics of Bulgaria and from import data of selected trading partner countries.

[2] Data from official Bulgarian export statistics.

[3] Data from United Nations Economic Commission for Europe. Statistics of World Trade in Steel, 1972 and 1973 ed., New York, 1973 and 1974.

[4] Data from United Nations, World Energy Supplies, 1970–73, series J, No. 18, New York, 1975.

Sources: Official trade returns of Bulgaria, Poland, Romania, and the U.S.S.R. for 1972 and 1973. United Nations Statistical Office, Supplement to the World Trade Annual, 1972 ed., v. 1, 1975, and World Trade Annual, 1973 ed., vs. 1–3, New York, 1975. United Nations Economic Commission for Europe, Statistics of World Trade in Steel, 1972 and 1973 ed., New York, 1973 and 1974. United Nations World Energy Supplies 1970–73, ser. J, No. 18, New York, 1975.

## Table 3.—Bulgaria: Imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Alumina | r 1,763 | 2,147 | West Germany 1,157; Italy 540; Japan 450. |
| Metal including alloys, all forms | [2]30,513 | 36,153 | U.S.S.R. 26,343; Yugoslavia 4,858; West Germany 2,836. |
| Antimony | 100 | 700 | All from U.S.S.R. |
| Copper: | | | |
| Ore and concentrate | 3,775 | 79 | All from Poland. |
| Metal including alloys, all forms | 4,281 | 5,517 | U.S.S.R. 1,904; Yugoslavia 1,286; Austria 938. |
| Iron and steel: | | | |
| Iron ore thousand tons | 1,460 | 1,886 | U.S.S.R. 1,606. |
| Metal: | | | |
| Scrap do | 5 | 31 | Spain 26; Poland 5. |
| Pig iron [2] do | 307 | 268 | All from U.S.S.R. |
| Ferroalloys do | r 13 | 14 | Mainly from U.S.S.R. |
| Steel, primary forms do | -- | 7 | Mainly from Yugoslavia. |
| Semimanufactures: [3] | | | |
| Bars, rods, sections do | 426 | 506 | U.S.S.R. 384; Poland 85. |
| Plates and sheets do | 278 | 368 | U.S.S.R. 227; West Germany 52; Italy 33. |
| Hoop and strip do | 17 | 24 | West Germany 10; Italy 3; Poland 3. |
| Rails and accessories do | 55 | 61 | U.S.S.R. 44; Yugoslavia 7; Austria 6. |
| Wire do | 19 | 20 | U.S.S.R. 7; West Germany 4; Austria 3. |
| Pipes, tubes, fittings do | 135 | 141 | U.S.S.R. 55; Italy 49; Poland 13. |
| Castings and forgings do | 1 | 1 | Mainly from Poland. |
| Total do | 931 | 1,121 | |
| Lead: | | | |
| Ore and concentrate | 1,897 | NA | |
| Metal including alloys, all forms | 170 | NA | |

See footnotes at end of table.

## Table 3.—Bulgaria: Imports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Manganese: | | | |
| Ore and concentrate thousand tons | 103 | 108 | All from U.S.S.R. |
| Oxide | 220 | 120 | All from Japan. |
| Mercury 76-pound flasks | -- | 609 | All from Yugoslavia. |
| Nickel including alloys, all forms | 249 | 359 | West Germany 256; United Kingdom 103. |
| Platinum-group metals value, thousands | r $124 | $270 | All from Switzerland. |
| Tin: | | | |
| Oxides long tons | 23 | 16 | All from West Germany. |
| Metal including alloys, all forms do | 382 | 477 | All from United Kingdom. |
| Titanium oxides | 1,280 | 1,366 | Italy 1,221; West Germany 145. |
| Tungsten: | | | |
| Ore and concentrate | 20 | NA | |
| Metal | -- | 6 | All from United Kingdom. |
| Zinc ore and concentrate | 42,356 | 45,624 | All from Yugoslavia. |
| Other metal including alloys: | | | |
| Metalloids | r 1,086 | 531 | Do. |
| Scrap | 139 | NA | |
| Unwrought and semimanufactures | r 2,750 | 3,224 | All from U.S.S.R. |
| NONMETALS | | | |
| Abrasives: | | | |
| Dust of semiprecious stones value, thousands | $110 | $138 | All from Belgium-Luxembourg. |
| Grinding and polishing wheels and stones | 111 | 200 | Austria 81; United Kingdom 55; Italy 29. |
| Asbestos | 19,700 | 30,592 | All from U.S.S.R. |
| Cement [2] thousand tons | 166 | 143 | U.S.S.R. 139. |
| Clays and clay products: | | | |
| Crude | 729 | 1,325 | All from United Kingdom. |
| Products, refractory and nonrefractory | 26,849 | 43,826 | U.S.S.R. 36,384; Italy 4,195; Yugoslavia 3,247 |
| Diamond, industrial value, thousands | $175 | $301 | All from Belgium-Luxembourg. |
| Feldspar and fluorspar | r 468 | 632 | All from West Germany. |
| Fertilizer materials: [4] | | | |
| Crude: | | | |
| Phosphatic (apatite concentrates) | r 395,600 | 428,900 | All from U.S.S.R. |
| Potassic (salts) | 130,900 | 75,800 | Do. |
| Manufactured: | | | |
| Phosphatic | r 226,061 | 344,789 | U.S.S.R. 182,100; Yugoslavia 80,481; Spain 71,208. |
| Mixed | 9,304 | 18,319 | All from Yugoslavia. |
| Pigments, mineral, iron oxide | 319 | NA | |
| Salt thousand tons | 124 | 164 | All from Romania. |
| Sodium and potassium compounds: | | | |
| Caustic soda | 374 | 560 | All from Italy. |
| Caustic potash | 165 | NA | |
| Sodium sulfate | 10,693 | 18,266 | All from East Germany. |
| Sulfur | 6,029 | 7,649 | U.S.S.R. 6,618; Greece 992. |
| Other: | | | |
| Crude nonmetals | 396 | 177 | NA. |
| Oxides and hydroxides of barium, strontium, and magnesium | 132 | 91 | All from France. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black [2] | 14,780 | 16,964 | U.S.S.R. 15,336. |
| Coal, all grades thousand tons | 5,699 | 5,762 | U.S.S.R. 5,699. |
| Coke [2] do | 395 | 375 | U.S.S.R. 299; Czechoslovakia 41; Poland 35. |
| Petroleum: | | | |
| Crude [2] thousand 42-gallon barrels | 60,755 | 70,836 | U.S.S.R. 55,221. |
| Refinery products: | | | |
| Gasoline do | 12 | 9 | All from Romania. |
| Kerosine do | 5 | NA | |
| Distillate fuel oil do | r 494 | 225 | Romania 207; Greece 18. |
| Residual fuel oil do | r 666 | 981 | Romania 834; Greece 147. |
| Lubricants do | r 37 | 50 | Netherlands 16; Belgium-Luxembourg 11; United Kingdom 8. |
| Other do | r 7 | 5 | United Kingdom 3; Netherlands 2. |

See footnotes at end of table.

Table 3.—Bulgaria: Imports of selected mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 13,223 | 18,524 | U.S.S.R. 18,056. |

r Revised. NA Not available.
[1] Compiled from official import statistics of Bulgaria and from export data of selected trading partner countries.
[2] Data from official Bulgarian import statistics.
[3] Because of the incomplete nature of official Bulgarian import statistics for steel, such data have been taken from the United Nations, New York, World Trade in Steel, 1974.
[4] Official Bulgarian import statistics report 1,058,000 tons of all types of fertilizer imported in 1972, considerably in excess of the totals for the commodities listed, which were derived from trading partner export statistics. Among the source countries listed in official import statistics but not covered by trading partner export data was Tunisia, which supplied 118,000 tons in 1972, all of which was presumably phosphate rock. No equivalent data are available for 1973.

Source: Official trade returns of Bulgaria, East Germany, Poland, Romania, and the U.S.S.R. for 1972 and 1973. United Nations Statistical Office, Supplement to the World Trade Annual, 1972 ed., v. 1, 1975, and World Trade Annual, 1973 ed., vs. 1–3, New York, 1975. United Nations Economic Commission for Europe, Statistics of World Trade in Steel, 1972 and 1973 ed., New York, 1973 and 1974.

## COMMODITY REVIEW

### METALS

**Aluminum.**—An aluminum processing plant located near Shumen City is presently under construction and is planned to go into operation by 1977. It is to produce 48,000 tons of rolled products per year. Bulgaria imported 22,639 tons of aluminum from the U.S.S.R. in 1974.

**Copper.**—Copper mine output (metal content) for 1974 was 51,600 tons, showing an increase of 7.5% over that of 1973. The estimated production of blister, including secondary, was 55,000 tons and that of refined electrolytic copper was 48,000 tons, including secondary.

Approximately 80% of Bulgaria's copper ore is surface mined with the Medet open pit alone accounting for 75% of the total copper ore production. It had reached its capacity of 8 million tons per year of ore in 1972 and has since maintained this production level. The ores at Medet average 0.36% copper and 0.008% molybdenum. The Chelopech mine (near Sofia) is Bulgaria's largest underground copper mine and started operation in 1971 with 100,000 tons of ore per year, containing 0.5% to 1.5% copper. In 1975, this mine was to reach an ore production of 500,000 tons per year.

**Iron and Steel.**—In 1974, Bulgaria produced 2,188,000 tons of crude steel (2.6% lower than in 1973), 1,528,000 tons of pig iron, including blast furnace ferroalloys (5.1% lower than in 1973), and 2,685,000 tons of iron ore and concentrate (3.2% lower than in 1973). Bulgaria imported 2.4 million tons of iron ore (2.0 million tons from the U.S.S.R.) and 340,000 tons of pig iron (318,000 tons from the U.S.S.R.).

The Nation's two steel plants, both located near Sofia, were under expansion in order to meet the planned production of 3 million tons of crude steel by yearend 1975. The Kremikovtsi metallurgical complex, the larger of the two, reported considerable delays in production due to breakdowns in machinery, poor maintenance and repair, and insufficient skilled labor.[8] In addition, one of the largest furnaces at this plant was being reconstructed during 1974. The new 1,200-millimeter, 5-unit, cold-rolling mill, supplied by France, was put into operation at Kremikovtsi during 1974 and will be producing sheet steel as well as tin, zinc, and plastic-coated sheets.

An agreement was signed in 1974 by the COMECON countries for their participation in the construction of one of the largest steel mills in the U.S.S.R. In return for participation in the construction, Bulgaria will receive iron ore concentrates from the U.S.S.R.[9]

**Lead and Zinc.**—Lead smelter production (including secondary) for 1974 was estimated at 112,000 tons while that of zinc was estimated at 80,000 tons. No major changes or new developments were reported in the Bulgarian lead-zinc industry. Bulgaria exported 1,547 tons of lead to the

[8] Trud (Labor), Sofia, Oct. 2, 1975, pp. 1–2.
[9] Rabotnichesko Delo (Labor Review), Sofia, May 18, 1975, p. 4.

U.S.S.R. in 1973 and only 290 tons in 1974.[10]

All the Bulgarian lead-zinc ore is mined by underground methods and in 1974 mining was conducted at depths of 350 to 400 meters. The Gorubso Enterprise produced about 70% of the nation's lead and zinc in 1974.

**Uranium.**—Bulgaria has substantial uranium deposits which appear to have been well explored. The largest concentration of uranium occurs just north of Bukhovo in the Sofia Basin. Here the ore has been reported to contain as much as 2% of $U_3O_8$. The second deposit is found at Strelcha, 7 miles east of Panagiurishte. Other deposits are located in the Rhodope Mountains south of Asenovgrad where a large mine is located between Madan and Zlatograd.

Estimated reserves of uranium metal in Bulgaria are approximately 15,000 tons (17,689 tons of $U_3O_8$ and the estimated production capability is 100 tons per year of $U_3O_8$.[11] It is assumed that all of the uranium mined in Bulgaria in 1974 was exported to the U.S.S.R. Current data on Bulgaria's uranium reserves and mining is nonexistent due to the element of high secrecy imposed upon the uranium industries of the centrally planned economy countries.

## NONMETALS

**Asbestos.**—In order to satisfy its asbestos requirements, Bulgaria agreed to participate in the development of a complex for producing asbestos at the Kiembaev deposit in the Urals, U.S.S.R. In return, Bulgaria is to start receiving 40,000 tons of asbestos per year beginning in 1982.[12]

**Cement.**—Cement production for 1974 was 4.3 million tons, showing only a 2.8% increase over that of 1973. Bulgaria exported a total of 143,000 tons of cement and, in return, imported a total of 163,000 tons of which 137,000 tons came from the U.S.S.R.

Bulgaria is expanding and modernizing its six major cement plants in order to reach the planned 6-million-ton-per-year production capacity by yearend 1975. At that time, the Reka Devnya cement plant was to reach a 2-million-ton-per-year capacity, while the Zlatna Panega plant at Lukovit was to produce 1.6 million tons per year.

**Fertilizer Materials.**—Production of nitrogen fertilizers in 1974 was 525,000 tons (N content), an increase of only 1% over that of 1973. Phosphatic fertilizer production reached 188,000 tons ($P_2O_5$ content), showing a marked improvement of 39% over that of 1973. Bulgaria is self-sufficient in nitrogen fertilizers and exported 69,200 tons (N content) in 1974. The 1974 imports of phosphatic and potassium fertilizers were 34,300 tons ($P_2O_5$ content) and 44,000 tons ($K_2O$ content), respectively.

Bulgaria is expanding chemical complexes in order to increase mineral fertilizer production and thus to become self-sufficient by yearend 1980. During 1974, the compound fertilizer and soda ash complex at Devnya, near Varna, was brought into operation. The complex is composed of a 200,000-ton-per-year ammonia plant, a compound fertilizer unit (160,000 tons per year of $P_2O_5$); and a triple superphosphate plant (150,000 tons per year of $P_2O_5$). This complex was one of the major projects which Bulgaria has built in cooperation with the other COMECON countries. The greater part of the support came from the U.S.S.R., while Hungary helped with capital investment. An urea plant, with capacity of 450,000 tons per year, is planned for future construction at this complex.

A new compound fertilizer plant at Povelianovo is expected to start production in 1975 with a capacity of 914,000 tons per year. At the same site, a new ammonia plant is under construction and is to have a capacity of 190,000 tons per year of ammonia and a 276,000 tons per year of ammonium sulfate.[13]

An agreement between Bulgaria and the U.S.S.R. was signed in 1974 under which Bulgaria is to participate in the construction of the Kingisepp phosphate fertilizer plant in the U.S.S.R. As payment for such participation, Bulgaria is to receive 50,000 tons of fertilizers per year for a period of 10 years, beginning in 1976.

**Sulfur.**—In 1974, the production of elemental sulfur was 185,000 tons, an increase of 3% over that of 1973. Imports of 7,991 tons came from the Soviet Union in 1974. Bulgaria produced an estimated 150,000 tons of pyrite, with a total sulfur content of 63,000 tons.

[10] Vneshnyaya Torgovlya S.S.S.R. za 1974 (U.S.S.R. Foreign Trade for 1974), Moscow, 1975, p. 130.

[11] Analysis of Energy Resources and Programs of the Soviet Union and Eastern Europe. Tech. Rept. RADC–TR–74–204, December 1973, pp. 57–77.

[12] Work cited in footnote 9.

[13] Nitrogen, No. 99, January–February 1976.

Sulfuric acid production in 1974 reached 761,000 tons, an increase of 35% over that of 1973.[14] The bulk of this increase came from the 600,000-ton-per-year acid plant at the new Povelianovo fertilizer complex.[15] Plans were drawn up during 1974 for a new sulfuric acid section at the chemical complex in Dimitrovgrad.

## MINERAL FUELS

Bulgaria's total primary energy consumption for 1974 reached an estimated 36.0 million tons of standard fuel equivalent, showing an increase of 3.4% over that of 1973. Coal provided 51.2% of the total primary energy while oil represented 45.0%, natural gas 1.6%, hydroelectric power 0.8%, nuclear power 0.3%, and imported electric power 1.1%. Total primary energy balances of Bulgaria for 1973 and 1974 are shown in table 4.

[14] Page 95 of work cited in footnote 5.
[15] Sulphur, No. 117, March–April 1975, p. 12.

**Table 4.—Bulgaria: Primary energy balance 1973–74**
(Million tons of standard fuel equivalent) [1]

| | Total primary energy | | Coal | | Crude oil | | Natural gas | | Hydro-electric power | | Nuclear power | | Imported electric power | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1973 | 1974 | 1973 | 1974 | 1973 | 1974 | 1973 | 1974 | 1973 | 1974 | 1973 | 1974[2] | 1973 | 1974 |
| Production [3] | 14.5 | 13.1 | 13.6 | 12.3 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.3 | -- | 0.1 | -- | -- |
| Exports | .2 | .1 | .2 | .1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Imports | 20.5 | 23.0 | 5.9 | 6.2 | 14.2 | 16.0 | -- | .4 | -- | -- | -- | -- | -- | -- |
| Apparent consumption | 34.8 | 36.0 | 19.3 | 18.4 | 14.5 | 16.2 | .3 | .6 | .3 | .3 | -- | .1 | .4 | .4 |

[1] Conversion factors used are hard coal, 1.0; lignite and brown coal, 0.5; crude oil, 1.47; natural gas, 1.33 (per 1,000 cubic meters); hydroelectric and nuclear power 0.125 (per 1,000 kilowatt-hours), from World Energy Supplies, Statistical Papers, ser. J. No, 18, United Nations, New York, 1975.
[2] Bulletin of Electric Energy Statistics for Europe, v. 20, No. 2, United Nations, New York, 1975, p. 7.
[3] Production, see table 1.
Source: Data for 1973 from Statisticheski Godishnik na Narodna Republika B'lgariya 1974 (Statistical Yearbook of the People's Republic of Bulgaria 1974), Sofia, 1974.
Data for 1974 from Statisticheskiy Yezhegodnik stran-chlenov Soveta Ekonomicheskoy Vzaimopomoshchi (Statistical Yearbook of the COMECON countries), Moscow, 1975.

In order to meet its fuel requirements, Bulgaria had to import 64% of its total primary energy. In 1974, 10.9 million tons of crude oil and 6.2 million tons of anthracite and bituminous coal were imported, representing 44.4% and 17.2% of the total primary energy consumption, respectively. In addition, about 307 million cubic meters of natural gas were received through the newly finished gas pipeline from the Soviet Union, representing 1.1% of the primary energy consumption.

In 1974, a total of 22.8 billion kilowatt-hours of electric energy was produced by Bulgarian electric powerstations, showing a 3.9% increase over that of 1973. Of this energy, 19.8 billion kilowatt-hours was produced by thermal powerplants, 2.1 billion by hydroelectric plants, and 0.9 billion by the newly operational nuclear powerplant. Bulgaria had to import an additional 3.6 billion kilowatt-hours from the U.S.S.R. to meet its electric energy demand. Bulgaria's first nuclear powerplant was put into operation during 1974. A total of 928 million kilowatt-hours was produced during the year. By 1980, when the plant is to reach full capacity, it is to generate over 20% of Bulgaria's electric power needs.

**Coal.**—Production of coal in 1974 was 24.3 million tons, a decrease of 9.3% compared with that of 1973. Practically all of the coal is lower rank lignite and brown coal (24 million tons) and only 300,000 tons is either anthracite or bituminous.

In 1974, Bulgaria imported a total of 6.2 million tons of bituminous coal and anthracite of which 5.8 million tons came from the U.S.S.R.

Bulgaria's lignite production comes mainly from the Maritsa East Basin where the lignite is surface-mined. Reserves there are estimated at 3 billion tons of lignite, ranging in caloric value from 1,200 kilocalories per kilogram to 1,600 kilocalories per kilogram (average being 1,300 kilocalories per kilogram). Planned production goals at this basin were set at approximately 17 million tons in 1975. This will allow the production of 1.4 million tons of briquets and about 6 billion kilowatt-hours of electric energy which comprises about 23% of the total electric energy of the country.[16]

Bulgaria plans to produce a total of 31 million tons of coal in 1975. This goal was reported somewhat hard to achieve due to setbacks in the coal mining industry such as equipment breakdowns, problems in transportation, shortage of personnel, and poor equipment maintenance.[17]

With respect to the higher quality coals, especially brown coal, reserves are continuously decreasing in many of the existing mines. At the G. Dimitrov, Marbass, Chukurovo, and Black Sea mines the reserves are almost depleted. Bulgaria hopes to maintain brown coal output by the development of new mines in existing regions, especially in Bobov-Dol where a large share of brown coal is allocated to the new 630-megawatt thermoelectric powerstation which was under construction in 1974.[18]

**Natural Gas.**—Extraction of usable Bulgarian gas in 1974 was 6,360 million cubic feet (180 million cubic meters), a decrease of 19% from 1973. The North Bulgarian region was being investigated for gas resources and about 53 billion cubic feet (1.5 billion cubic meters) per year was planned to be extracted by the year 1990.[19]

The Bulgarian section of the natural gas pipeline, extending from the Soviet Union, was completed in July and started pumping gas shortly thereafter. According to the Soviet-Bulgarian agreement, Bulgaria is to receive 3 billion cubic meters of natural gas every year, starting with 1975. In 1974, 1 billion cubic meters were planned to be delivered but only 306,920,000 cubic meters were received.[20] The main delay was in the completion of the pipeline in Bulgarian territory, particularly distribution lines to various industrial complexes.[21] The chemical complex at Vratsa was the first to receive gas. The Devnya industrial complex near Varna also received gas during 1974. The main extension of the pipeline to Sofia, where the Kremikovtsi metallurgical complex is to be its most important consumer, was not yet finished and was to receive gas only in 1975.[22]

An agreement was signed in June, between the U.S.S.R. and the other COMECON countries for participation in the con-

[16] Tsenkov, Ts. Ispol'zovanie sobstvennykh toplivnoenergeticheskikh resursov NRB" (Use of Bulgarian Domestic Fuel Resources). Ekonomicheskoye sotrudnichestvo stran-chlenov SEV (Economic Collaboration of COMECON Countries), Moscow, No. 5, 1975, pp. 20–25.

[17] Rudnichar (The Miner), Sofia, No. 14, 1974, pp. 1–2.

[18] Page 23 of work cited in footnote 16.

[19] Page 21 of work cited in footnote 16.

[20] Vneshnyaya Torgovlya S.S.S.R. za 1974 god (U.S.S.R. Foreign Trade for 1974), Moscow, 1975, p. 126.

[21] Trud (Labor), July 13, 1974.

[22] Rabotnichesko Delo (Labor Review), July 9, 1974.

struction of a large-diameter pipeline which is to deliver natural gas from the Orenburg gas condensate deposit, located in the southern Urals, to the western borders of the U.S.S.R. Bulgaria's reimbursement for the participation in the pipeline construction is to be 2.8 billion cubic meters of gas per year.[23]

**Petroleum.**—Crude oil output in 1974 was 144,000 tons, a decrease of 24% compared with that of 1973, continuing the declining trend of the past 5 years. This decrease in production was due mainly to lower output at the Pleven oilfields. The original expectations of the Dolni Dabnik Field, which was the richest oil find so far, was discouraging and reserves were found to be smaller than expected. Since domestic production is only approximately 1% of the country's total consumption, Bulgaria is almost totally dependent upon oil imports, largely from the Soviet Union. Soviet crude oil deliveries of 10,885,000 tons in 1974 were more than twice the volume delivered in 1970.[24] Small quantities of crude was also imported from Iran, Iraq, Libya, and Egypt.

Plans have been completed and construction started on the expansion and modernization of the Burgas and Pleven oil refining and petrochemical centers. The Soviet assisted construction of a new oil refining installation at Burgas was under way. The annual crude capacity at Burgas, where the Soviet crude oil is processed, amounted to 13.5 million tons in 1974.

The 1-million-ton-per-year capacity refinery at Pleven has been expanded and a new 6-million-ton-per-year refinery was under construction. The Pleven plant processed crude oil obtained from the Dolni Dabnik fields or delivered from the Soviet Union and Arab countries.

Under a new agreement with the U.S.S.R., Bulgaria is planning to build several petrochemical plants between the years 1976 and 1980.

Bulgaria, with the help of the Soviet Union, was considering offshore exploration in the Black Sea and was planning joint projects with other countries. Interest in such projects was shown by companies in the United States, the United Kingdom, and Japan.

Due to the shortage of crude oil, Bulgaria is taking a hard look at its oil shale resources and, in 1974, established a ministry specifically to look into the exploration, extraction, and utilization of oil shale. Several large oil shale deposits have been discovered and the total resources are now estimated at approximately 4 billion tons. These deposits were found in the Burkovo-Nikolaevo, Stara Zagora, Sliven, Pernîk, and the Khaskovo Districts.

**Nuclear Energy.**—The first reactor of Bulgaria's first nuclear powerplant, located near Kozloduy on the Danube, started up in July and was officially commissioned in September 1974 when the plant produced 98 million kilowatt-hours. A total of 928 million kilowatt-hours was produced in 1974. The second reactor is to go into operation by yearend 1975.[25] The nuclear powerplant was built in close collaboration with the Soviet Union, according to an agreement signed in July 1966. It is of a standard design, which is now used by all the COMECON countries, employing two of the Voronezh type VVER–440 light-water reactors, each having a capacity of 440 megawatts thus providing a total capacity of 880 megawatts. The Soviet Union provided the design, most of the equipment, and supervised the construction which began in October 1969.

The construction of the second section of the Kozloduy powerplant was in progress where the third and fourth reactors are planned to start operation in 1978 and 1979. This section is almost an exact duplicate of the first section, having also two 440-megawatt reactors thus providing an additional 880 megawatts of capacity. Therefore, by 1980, when both sections of this powerplant are in full operation, Bulgaria will have 1,760 megawatts of nuclear power which is to provide more than 11 billion kilowatt-hours per year or over 20% of the Nation's total electric power.[26]

[23] Work cited in footnote 9.
[24] Page 126 of work cited in footnote 10.
[25] Marinov, Marin. Construction Program for 1974 Outlined. Politicheska Agitatsiya (Political Force), Sofia, No. 1, January 1974, pp. 17–24.
[26] Otechestven Front (Country Front), Sofia, July 10, 1973.

# The Mineral Industry of Burma

By Timothy Adams [1]

Burma's mineral industry again stagnated, mainly because of the lack of modern equipment and insurgent activity. Exports of base metals and ores were approximately the same as in 1973. Burma will continue to export as much of its mineral output as possible to earn foreign exchange. With technical and financial assistance from U.S. and other bilateral sources, Burma moved to renovate existing mines and explore for new mineral resources.

An important agreement was signed with the Federal Republic of Germany to modernize the Bawdwin-lead-zinc mines. Capital allocations for the project were $11 million for open pit improvements, $19 million for the flotation mill, and $4 million for support facilities which include a 5,000-kilowatt hydroelectric plant. However, a West German mining technician was kidnapped near the Bawdwin mine in March. As a result, the Ministry of Mines recalled all foreign mineral experts under its jurisdiction to Rangoon and foreign assistance for Burma's mineral industry came to a virtual standstill.

The granting of concessions for offshore oil exploration to foreign oil companies marked a major change in mineral policy. Based on Indonesian experience, 13 of 25 offshore blocks were opened for development and were subjected to intensive seismic exploration and drilling activities. Also indicative of change was the completed survey of the Myanma copper deposits by a Japanese team. The Government of Burma was reported as seriously considering proposals from private foreign firms to develop the project. This marked a significant departure from previous policy regarding private foreign investment in the Burma mineral industry. This change may open other opportunities, albeit slowly, in this field in the future.

## PRODUCTION

Value of mineral production in Burma increased approximately 12% in 1974, the only sector of the Burmese economy to surpass targeted growth rates. Production of major minerals, including coal but excluding pertoleum, increased a marginal 5%. Considering the low level to which mineral production declined in 1973, the small increase in 1974 was insignificant. However, it did represent a temporary reversal of the declining trend in Burma's total mineral production. Generally, production of industrial minerals in 1974 remained close to past levels with yearly fluctuations in output caused largely by demand patterns of Government-operated industries.[2]

[1] Physical scientist, Division of Nonmetallic Minerals.

[2] U.S. Embassy, Rangoon, Burma. State Department Airgram A-057, May 22, 1975.

## Table 1.—Burma: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Antimony, mine output, metal content | 131 | 143 | 166 |
| Copper: | | | |
| Mine output, metal content [e] | 80 | 74 | 71 |
| Matte, gross weight | 179 | 165 | 159 |
| Iron and steel: | | | |
| Crude steel [e] | [r] 15,000 | 20,000 | 20,000 |
| Semimanufactures [e] | [r] 25,000 | 30,000 | 30,000 |
| Lead: | | | |
| Mine output, metal content [e] | [r] 10,200 | 10,100 | 9,300 |
| Smelter: | | | |
| Refined lead | 8,431 | 9,814 | 9,008 |
| Antimonial lead (18% to 20% antimony) | 331 | 279 | 359 |
| Manganese ore, gross weight | 279 | 279 | NA |
| Nickel: | | | |
| Mine output, metal content | 26 | 21 | 22 |
| Speiss, gross weight | 104 | 83 | 87 |
| Silver, mine output—thousand troy ounces | 587 | 718 | 301 |
| Tin, mine output: | | | |
| Metal content of tin concentrate—long tons | 319 | 245 | 265 |
| Metal content of tin-tungsten concentrate—do | 265 | 356 | 248 |
| Total—do | 584 | 601 | 513 |
| Tungsten, mine output: | | | |
| Metal content of tungsten ores | 266 | 266 | 345 |
| Metal content of tin-tungsten concentrate | 184 | 248 | 173 |
| Total | 450 | 514 | 518 |
| Zinc, mine output, metal content | [r] 3,967 | 3,874 | 3,001 |
| **NONMETALS** | | | |
| Barite | [r] 20,574 | 15,241 | 15,241 |
| Cement, hydraulic—thousand tons | 214 | 193 | 172 |
| Clays: | | | |
| Ball clay | [r] 15,401 | 10,343 | [e] 4,000 |
| Bentonite | [r] 620 | 841 | [e] 500 |
| Fire clay | [2 r] 2,337 | [2] 2,665 | [e] 2,000 |
| Industrial white clay | [r] 2,472 | 2,642 | [e] 2,100 |
| Feldspar | [r] 914 | 311 | 660 |
| Fluorspar | [r] 183 | [e] 200 | [e] 200 |
| Graphite | [r] 91 | 183 | 305 |
| Gypsum | 14,895 | 15,647 | [e] 16,000 |
| Precious and semiprecious stones: | | | |
| Jadeite—kilograms | 2,750 | 6,973 | 8,808 |
| Unspecified—carats | NA | 52,528 | NA |
| Salt—thousand tons | [r] 157 | 173 | 125 |
| Sand: | | | |
| Glass sand, brown | [r] 2,093 | 6,300 | NA |
| Glass sand, white | 4,491 | | |
| Stone: | | | |
| Dolomite | 914 | 1,207 | 406 |
| Limestone, crushed and broken—thousand tons | [r] 600 | 600 | 530 |
| Quartz | [r] 134 | 55 | 360 |
| Talc and related materials, soapstone | [e] 220 | 128 | [e] 150 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Coal | 21,456 | 14,450 | 16,811 |
| Gas, natural: | | | |
| Gross production—million cubic feet | 11,300 | 12,000 | [e] 11,000 |
| Marketed production—do | 3,900 | 5,400 | [e] 4,900 |
| Petroleum: | | | |
| Crude—thousand 42-gallon barrels | 7,466 | 7,514 | 7,581 |
| Refinery products: | | | |
| Gasoline—do | 1,480 | 1,394 | 1,498 |
| Jet fuel—do | 234 | 249 | 223 |
| Kerosine—do | 1,623 | 1,677 | 1,687 |
| Distillate fuel oil—do | 2,180 | 1,960 | 1,693 |
| Residual fuel oil—do | 1,500 | 1,549 | 1,021 |
| Other—do | 679 | 442 | NA |
| Refinery fuel and losses—do | 790 | 955 | NA |
| Total—do | 8,486 | 8,226 | NA |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, Burma also produces pottery clay, common sand, gravel, other varieties of crude construction stone, and other varieties of gem stones, but available information is inadequate to make reliable estimates of output levels.

[2] Includes fire clay powder.

## TRADE

Burma's overall foreign trade decreased from about $240 million in 1972–73 to an estimated $215 million in 1973–74. Although production increased in 1974, export volume of base minerals and ores declined about 16% from 1973 figures. silver exports at $0.6 million.

In 1972–73, base metal exports were estimated at $6.6 million and silver exports at $1.2 million. In 1973–74, base metal exports were estimated at $4.2 million and silver exports at $0.6 million.

Burma's imports of mineral and related products dropped somewhat from the estimated $21.4 million in 1972–73. The largest item has been base metals and manufactures. Coal and coke imports continued high.

Mineral industry reports were not obtainable from the Government on a timely basis. Hence, much of the information was estimated from available statistics published by the Central Statistical Organization, Rangoon, and other sources such as Mining Annual Review.

The latest specific commodity data on mineral exports and imports are shown in tabels 2 and 3 for the years 1971–72.

**Table 2.—Burma: Exports and reexports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1971 | 1972 | Principal destinations, 1972 |
|---|---|---|---|
| METALS | | | |
| Antimony ore and concentrate | r 563 | 404 | West Germany 153; Belgium-Luxembourg 152; Yugoslavia 99. |
| Copper matte | 239 | 184 | All to Belgium-Luxembourg. |
| Lead metal, unwrought: | | | |
| Refined | 7,423 | 8,583 | India 8,563. |
| Antimonial | 427 | 228 | All to India. |
| Nickel matte and speiss | 2,207 | 166 | All to West Germany. |
| Silver, unwrought thousand troy ounces | 451 | 905 | United Kingdom 601; Japan 103; Netherlands 101; Italy 100. |
| Tin ore and concentrate - long tons | 1,604 | 999 | Spain 541; Netherlands 273. |
| Tungsten: | | | |
| Straight tungsten concentrates | 260 | 492 | West Germany 420. |
| Mixed tin-tungsten concentrates | 340 | 258 | Netherlands 186; United Kingdom 72. |
| Zinc ore and concentrate | 4,757 | 3,191 | All to Japan. |
| NONMETALS | | | |
| Cement | -- | 40 | NA. |
| Gem stones other than diamond: | | | |
| Jade: | | | |
| Uncut ---thousand carats | 174 | 98 | Hong Kong 91. |
| Cut but not set ---do | 94 | 1,525 | Hong Kong 1,500. |
| Rubies: | | | |
| Uncut ---do | 22 | -- | |
| Cut but not set ---do | 2 | 3 | Switzerland 1; Japan 1. |
| Sapphires: | | | |
| Uncut ---do | 38 | -- | |
| Cut but not set ---do | 5 | 2 | Spain 1. |
| Precious and semiprecious stones, n.e.s.: | | | |
| Uncut ---do | -- | (1) | All to Switzerland. |
| Cut but not set | 1 | 6 | People's Republic of China 4. |
| Salt | 16,153 | 24,826 | Singapore 24,448. |
| Other nonmetals, n.e.s. | (1) | 1 | Mainly to Japan. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal, anthracite and bituminous | -- | 6 | NA. |
| Petroleum refinery products: | | | |
| Gasoline --- 42-gallon barrels | 1 | 4 | NA. |
| Kerosine ---do | 1 | 9 | NA. |
| Distillate fuel oil ---do | 15,881 | 8,599 | NA. |
| Residual fuel oil ---do | 42,978 | 54,999 | NA. |
| Lubricants ---do | 62 | 38 | NA. |
| Other ---do | r 401,303 | 449,561 | Japan 307,916; Malaysia 44,633; Singapore 36,658. |

r Revised. NA Not available.
1 Less than ½ unit.

## Table 3.—Burma: Imports of mineral commodities [1]

| Commodity | 1971 | 1972 | Principal sources, 1972 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Oxide and hydroxide | 10 | 11 | United States 10. |
| Metal including alloys: | | | |
| Unwrought | 613 | 362 | United Kingdom 245; Romania 116. |
| Semimanufactures | 1,594 | 173 | West Germany 149. |
| Arsenic trioxide, pentoxide and acids | 5 | 49 | All from West Germany. |
| Chromium oxides and hydroxides | 4 | 3 | Do. |
| Copper: | | | |
| Copper sulfate | (2) | 52 | Netherlands 50. |
| Metal including alloys: | | | |
| Unwrought | r 101 | 72 | United Kingdom 67. |
| Semimanufactures | 366 | 304 | Belgium-Luxembourg 149; Japan 104. |
| Iron and steel metal including alloys: | | | |
| Pig iron, including cast iron | 2,073 | 1,202 | West Germany 1,200. |
| Sponge iron, powder and shot | 247 | NA | |
| Ferroalloys | 92 | 4 | All from Hungary. |
| Steel, primary forms | r 14,217 | 14,682 | Republic of Korea 7,098; North Korea 4,101; Japan 3,482. |
| Semimanufactures | 81,727 | 62,405 | Japan 18,622; India 14,852; Belgium-Luxembourg 9,669. |
| Lead metal including alloys, all forms | 49 | 38 | Japan 34. |
| Manganese: | | | |
| Ore and concentrate | 4 | NA | |
| Oxides | 222 | 173 | All from Japan. |
| Mercury ——76-pound flasks | 899 | 108,582 | West Germany 108,153. |
| Nickel metal including alloys, all forms | 30 | 20 | United Kingdom 9; Belgium-Luxembourg 6. |
| Platinum-group metals including alloys, all forms ——troy ounces | 10 | -- | |
| Silver metal including alloys, all forms ——do | 542 | 670 | United Kingdom 650. |
| Tin: | | | |
| Oxides ——long tons | 1 | 1 | All from United Kingdom. |
| Metal including alloys, unwrought and semimanufactures ——do | 37 | 1 | All from Japan. |
| Titanium oxides | r 85 | 71 | Belgium-Luxembourg 29; United Kingdom 22; France 20. |
| Tungsten metal including alloys, all forms | (2) | (2) | All from United States. |
| Zinc: | | | |
| Oxides | 43 | 34 | Netherlands 13; United Kingdom 12; United States 5. |
| Metal including alloys, all forms | 170 | 350 | Japan 312. |
| Other: | | | |
| Ores and concentrates, n.e.s | NA | 2 | All from Sweden. |
| Oxides, hydroxides, peroxides of | | 55 | West Germany 42; Switzerland 11. |
| Base metals including alloys, metals n.e.s. | 22 | | |
| all forms | -- | (2) | Mainly from Japan. |
| **NONMETALS** | | | |
| Abrasives, natural, n.e.s. —— value thousands | $1 | $1 | Do. |
| Asbestos | 278 | 1,143 | Territory of South-West Africa 926; Canada 213. |
| Boric acid | 7 | 24 | India 13; Portugal 5. |
| Bromine | 1 | (2) | All from France. |
| Cement | 2,688 | 820 | West Germany 735. |
| Chalk | 23 | 25 | All from United Kingdom. |
| Clays and clay products: | | | |
| Crude clays, n.e.s.: | | | |
| Kaolin (china clay) | 24 | 774 | Japan 646; United Kingdom 128. |
| Other | 424 | 96 | Japan 54; United Kingdom 24; Netherlands 17. |
| Products: | | | |
| Refractory —— value thousands | $215 | $605 | Japan $430; West Germany $72. |
| Nonrefractory ——do | $9 | $59 | People's Republic of China $37; United Kingdom $21. |
| Diamond: | | | |
| Gem, not set or strung —— carats | 70 | -- | |
| Industrial —— value, thousands | $2 | (2) | All from Denmark. |
| Diatomite and other infusorial earth ——do | $5 | $5 | Mainly from United States. |
| Fertilizer materials: | | | |
| Manufactured: | | | |
| Nitrogenous | 7 | 55 | All from West Germany. |

See footnotes at end of table.

Table 3.—Burma: Imports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1971 | 1972 | Principal sources, 1972 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials—Continued | | | |
| Manufactured—Continued | | | |
| Phosphatic | 51 | 30,115 | All from Tunisia. |
| Potassic | 1 | -- | |
| Other, including mixed | 1 | -- | |
| Ammonia | 105 | 31 | Netherlands 16; United Kingdom 8; West Germany 5. |
| Graphite, natural | 117 | 6 | West Germany 5. |
| Gypsum ---value, thousands | -- | $2 | All from United Kingdom. |
| Iodine | 1 | 2 | Do. |
| Mica, all forms | (2) | 1 | Mainly from India. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural ---carats | -- | 234 | NA. |
| Manufactured ---do | 4,550,286 | -- | |
| Salt | r 46 | 188 | India 90; Pakistan 83. |
| Sodium and potassium compounds, n.e.s.,: | | | |
| Caustic soda | 5,798 | 8,667 | West Germany 3,671; Netherlands 2,695; United Kingdom 1,000. |
| Caustic potash, sodium and potassic peroxides | 25 | 9 | France 5; United Kingdom 3. |
| Stone, sand and gravel: | | | |
| Quartz and quartzite | (2) | 11 | All from Netherlands. |
| Sand, excluding metal-bearing | -- | 28 | United Kingdom 20. |
| Sulfur: | | | |
| Elemental | 406 | 1,264 | West Germany 1,204. |
| Sulfuric acid | 16 | 6 | United Kingdom 3; West Germany 2. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 104 | 252 | India 120; United Kingdom 100. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 35 | 2 | Mainly from West Germany. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | 50 | 142 | Japan 100; Romania 17. |
| Coal and briquets: | | | |
| Anthracite and bituminous | 210,602 | 126,755 | India 98,110; People's Republic of China 28,645. |
| Lignite and lignite products | 112 | -- | |
| Coke and semicoke | 740 | 508 | All from West Germany. |
| Hydrogen, helium, inert gases | 1 | 14 | Japan 11. |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 2,009 | 1,304 | Brunei 1,118; Malaysia 181. |
| Refinery products: | | | |
| Gasoline, motor and aviation ---do | 2 | 19 | Mainly from Iran. |
| Kerosine and jet fuel 42-gallon barrels | 392 | 105,924 | Singapore 58,829; Iran 46,832. |
| Residual fuel oil ---do | 50,273 | 56,691 | Bahrain 56,612. |
| Lubricants thousand 42-gallon barrels | r 120 | 100 | Japan 99. |
| Mineral jelly and wax 42-gallon barrels | r 1,771 | 563 | West Germany 354. |
| Other: | | | |
| Nonlubricating oils, n.e.s. thousand 42-gallon barrels | 8,823 | 8,705 | Iran 8,611. |
| Petroleum asphalt and pitch ---do | 109 | 191 | Japan 155; Singapore 36. |
| Bitumen and other residues ---do | (2) | (2) | All from West Germany. |
| Bituminous mixtures, n.e.s ---do | (2) | (2) | Mainly from West Germany. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 373 | 36 | All from United Kingdom. |

r Revised. NA Not available.
[1] Imports for consumption only; does not include imports into bond.
[2] Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Copper.**—Myanma Mineral Development Corp. (MDC) reported 26 million tons of copper ore at Sabetaung and 55 million tons at Kyesintaung. Diamond drilling continued in both areas to determine the extent of the porphyry copper mineralization.[3] The exploration program was con-

[3] World Mining. V. 27, No. 12, November 1974, p. 82.

ducted by Japanese personnel of the Metallic Minerals Exploration Agency of Japan. A pilot plant with a capacity of 30,000 tons per year of ore is to be constructed as a preliminary to joint Japanese-Burman development of the property. A feasibility study was begun for a refinery with a capacity of 20,000 tons per year of electrolytic copper by 1978.[4]

**Iron and Steel.**—The small Ywama steel plant, which has an electric furnace and rolling mills, remained the country's only steel producer. The plant, rated at 40,000 tons, continued to operate at approximately 50% capacity. Funds for construction of planned additional facilities continued to be unavailable.

**Lead, Zinc, Silver and Nickel.**—The government-owned Bawdwin enterprise in Northern Shan, operated by Bawdwin Mines Corp. (BMC), continued to be Burma's sole significant producer of nonferrous metals. The zinc concentrate produced was sold as such, mostly to Japan, whereas lead and other materials were sent to Namtu for smelting before marketing abroad.

The average grade of ore at Bawdwin apparently continued to decline. Output of ore from the mine increased, and a slight increase in the quantity of lead was reported. The old Namtu smelter with surplus capacity produced 9,300 tons of lead, 301,000 troy ounces of silver, and 3,001 tons of zinc concentrate.[5] A garnierite deposit was discovered in Chin State by the Directorate of Geological Survey and Exploration. Potential ore reserves were estimated at approximately 110 million tons at 1% nickel.[6]

**Tin and Tungsten.**—MDC continued to control most of the country's tin and tungsten mines. Concentrates were produced separately or in mixed form, and the combined annual output of the two related minerals was less than the average 2,200 tons of concentrates reported during the past 5 years. Although statistics were conflicting, Burma produced, in terms of metal content, approximately 400 to 760 long tons of tin and 300 to 500 tons of tungsten yearly. Most production came from the Tavoy and Mergui Districts in the Tenasserim district near the Thai border. The Mawski tin-tungsten mine probably accounted for about half of the total production. A contract was let to determine the feasibility of placer mining approximately 10,000 tons of tin-tungsten ore in the Heinze River Basin.[7] Third-stage rehabilitation of the Mawchi tin-tungsten mine continued. Output of tin-tungsten at Mawchi was planned to reach 1,800 tons per year metal content.[8]

## NONMETALS

**Cement.**—Three cement plants operated at Thayetmyo. Although all three produced at about 1,000 tons per day since the beginnning of 1974, Burma continued to experience cement shortages in many areas. The kilns presently use furnace oil as fuel, but a large natural gas deposit was found on the east side of the Irrawaddy River, about 22 miles south of Thayetmyo. The Government plans to pipe the gas to Thayetmyo but must first find the financing and equipment to build the pipeline.[9] Production for 1974 was 172,000 tons. Despite the openings of two new contract mills, lack of fuel held down production in 1974. Domestic supply lagged far behind demand.

Burma plans to establish a cement mill with 240,000 tons annual capacity at Kyoukse, about 20 miles south of Mandalay, with completion scheduled for 1978. If all planned expansions are completed, capacity will reach 860,000 tons per year and will provide Burma with a regular exportable surplus. Limestone will be supplied from a 450-million-ton deposit at Kyoukse, and gypsum will be brought by rail form Hsipow. The Tagundaing hydroelectric plant will supply power for the mill.[10]

**Fertilizer Materials.**—Burma had two urea plants located near the Chauk oilfields in central Burma which utilize the local natural gas deposits. Total output of urea in 1974 was 112,000 tons, or about 85% of capacity. Power constraints hindered greater output, but a new gas turbine generator should alleviate this problem. About 20,000 tons was exported in 1974 to take advantage of favorable prices.[11]

**Gem Stones.**—Uncut Burmese jade con-

[4] Metals Sourcebook. V. 11, No. 19, Oct. 14, 1974, p. 2.
[5] Page 82 of work cited in footnote 3.
[6] Page 82 of work cited in footnote 3.
[7] Mining Journal. No. 170, Mar. 14, 1975, p. 3946.
[8] Mining Journal. Mining Annual Review, June 1974, p. 411.
[9] U. S. Embassy, Rangoon, Burma. State Department Airgram A-038, Mar. 14, 1975, p. 4.
[10] Work cited in footnote 2.
[11] U.S. Embassy, Rangoon, Burma. State Department Telegram Rangoon 01325, May 17, 1974.

tinued to be of importance in world jewelry circles. Many mines are in insurgent territory near the border and much jade produced was presumably smuggled out of the country. Burma also produced ruby, sapphire, spinel, other precious stones, and cultured pearls.

Total sales at the Tenth Gem Emporium, held in February 1974, were valued at $4.4 million. Pearl sales accounted for $1.0 million, jade for $3.2 million, and gems for $0.2 million. The Geological Survey and Exploration Corp. announced the discovery in north Burma of a new jade vein extending from Hukaway Valley to Putao and beyond. The deposits were described as being of high quality.[12]

**Salt.**—Burma produced about 125,000 tons of salt in 1974. The decreased production reflected the slowing of the modernization program begun in 1971. Production in excess of domestic requirements was exported, mostly to Singapore.

**Stone**—*Marble.*—Construction of a marble slab factory on the Mogok-Madaya highway at a cost of $0.5 million neared completion. The Taunggok marble mountain is expected to yield 30 million tons, and another mountain between the Salween and Kun Chaung Rivers is expected to yield another 30 million tons. Tenders to purchase marble have been received from several countries. Japan took 50,000 cubic meters in 1973–74.[13]

## MINERAL FUELS

**Coal.**—The Kalewa coalfield in the northwest, sole producer in Burma, produced 16,811 tons in 1974, up from 14,450 tons in 1973. Burma's imports of coal were 126,755 tons in 1973.

**Petroleum.**—The decision to invite foreign participation in offshore oil exploration, on a profit-sharing basis, attracted widespread attention in the petroleum industry. Contracts were signed for offshore petroleum exploration in 13 of 25 blocks, with 4 private companies or consortia—1. Martaban Cities Service Inc., Robina Oil Co., Inc. of Singapore, Sun Oil Co.; 2. Arakan Oil Development Co., Japan Petroleum Development Corp., Kyodo Corp.; 3. Cie. Française des Pétroles, AGIP S.p.A., Leminex Corp.; 4. Esso Exploration & Production (Burma) Inc. By yearend 1974, the four groups established skeleton staffs in Rangoon and subcontracted for additional surveys.[14] Seven wells were drilled by June, and five seismic vessels were surveying offshore areas on a large scale. Onshore oil exploration was dominated by the Myanma Oil Co. (MOC), which began a drilling program involving 4 to 6 wells. MOC also sent out seismic and field geology teams to survey the central and south Irrawaddy Basin. The Burmese Government showed interest in developing the infrastructure for prolonged petroleum exploration by setting up a modern supply base in Rangoon. Bids were also solicited for the construction of special rigs for MOC's onshore operations. West Germany was approached for technical and financial assistance to construct a 500-mile pipeline to connect the oilfields with Rangoon.[15] Production of crude oil from Burma's onshore fields remained at about the same level as in 1973, 7.6 million barrels were reported, with half attributed to the Mann field. In July a potentially significant oil strike was announced at Letpando. The Government announced that the new field insured Burma's self-sufficiency in oil by 1976. Natural gas production decreased slightly.

Ouptut of refined products was essentially the same as in 1973. No progress was reported on the longstanding plans to expand the capacity of the refinery at Syriam.

Preliminary estimates for 1974 indicated Burma's imports of petroleum products increased in volume by over 100% when compared with 1973. Much of the increase was due to imports of crude petroleum which had been sharply reduced in 1973. However, imports of refined products continued at approximately 200,000 tons in an effort to alleviate local shortages.[16]

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[12] Page 412 of work cited in footnote 8.
[13] Short Wave Broadcast. FE/W789/A/19, Aug. 21, 1974.
[14] U.S. Embassy, Rangoon, Burma. State Department Airgram A-018, Feb. 7, 1975.
[15] Hokwon Ping, and Jim Matthews. Far Eastern Economic Review. Keeping up the Pace. V. 88, No. 25, June 20, 1975, pp. 50–52.
[16] Work cited in footnote 14.

# The Mineral Industry of Canada

By John A. Rathjen [1] and John M. Hague [2]

The total output of the Canadian mineral industry during 1974, including metallics, nonmetallics, structural materials, and mineral fuels established a new record of $11.7 billion [3] compared with $8.5 billion in 1973. This was an increase of 38% and marked the 16th consecutive annual increase in Canadian mineral production. The annual growth rate over the past 20 years has been about 9.8% with mineral fuels leading the other minerals in terms of value.

The value of production in the mineral fuels sector increased 60% to $5.22 billion in 1974 compared with $3.26 billion in 1973. Metal mine output reached a value of $4.89 billion in 1974, up from $3.88 billion a year ago, an increase of 26%. In nonmetals, production value was $895 million, an increase of 44% above the 1973 total of $620 million. The total value of structural materials rose to about $716 million in 1974 as compared with $679 million in 1973, an increase of about 5%. In terms of percentage of the total value the categories were as follows: Mineral fuels, 44.6%; metallics, 41.7%; nonmetallics, 7.6%; and structural materials, 6.1%.

The Canadian mineral industry provided 8.1% of the total gross national product (GNP), which was $142.6 billion in 1974. During this period the per capita value of mineral production went up to $522, an increase of $140 over 1973 and an alltime high.

The Canadian index of real domestic product (RDP) measures the volume of the country's gross output of goods and services in "constant dollars." It differs from the GNP in that it is a measure of production rather than income of Canadians. The RDP (1961=100) index figure for 1974 was 207.0, down slightly from 1973 when the published index was 210.5. The nominal decline was attributed to slowdowns in mining and a cutback in production of petroleum and natural gas during the second half of the year.

Investment trends in durable physical assets during 1974, including mineral industry capital and repair expenditures, increased in all categories over those of 1973. Investment in nonmetal mines was $377 million during 1974, 39.6% higher than in 1973. Petroleum and natural gas investments were up 28.7% to $1.4 billion, and metal mines increased 2.9% to $928 million. Higher investment was also apparent in the field of mineral-based manufactures. During 1974 the petroleum and coal based manufacturing industries spent a combined total of $585 million on new product lines. This represented an increase of 49.3% over 1973 expenditures. Primary metal manufacturing was up 29.4% to $1,056 million. The nonmetallic manufacturing area committed $313 million, an increase of 7.3%.

During 1974 Canada produced 62 individual mineral commodities, of which 10 accounted for 82.5% of the total value. The leading commodities, in percent of total value and with value expressed in millions were as follows: Petroleum, 30.8% ($3,616.9); copper, 12.1% ($1,412.1); nickel, 8.4% ($981.4); zinc, 7.7% ($900.0); iron ore, 6.2% ($724.4); natural gas, 5.9% ($692.7); natural gas by-products, 5.4% ($634.6); asbestos, 2.7% ($313.5); cement, 2.1% (246.9); and lead, 1.2% ($140.3). Although Canada does

[1] Mineral specialist, Division of Nonferrous Metals.

[2] Mining engineer, Division of Nonferrous Metals.

[3] Because of fluctuating exchange rates, a meaningful conversion to U.S. currency is impractical. At yearend 1974, however, the exchange rate was Can$0.9912=US$1.00, which was used in this chapter.

not mine bauxite, it is an important producer of primary aluminum metal from imported ore and alumina. In 1974 the value of Canadian aluminum production was estimated to be above $755 million.

Canadian exports from the minerals sector during 1974 including both crude and fabricated products reached $10.9 billion, an increase of 51.7% over those of 1973. The contribution from metals and minerals represented approximately 34.6% of the total Canadian export trade in 1974. All of the commodities registered gains in value although several reductions in quantity were recorded. These gains were attributed primarily to the strong demand and high level of world prices, although trade was somewhat hampered by government restrictions pertaining to petroleum and natural gas as well as production and transportation problems in mining. Of the mineral industry total, fossil fuels and their products were the leaders, with a total shipping value of $4.9 billion amounting to 45% of the gross value. This was more than double the 1973 value of $2.3 billion. Exports of metal, ores, concentrates, and scrap rose to $2.4 billion, an increase of $400 million or 17% above those of 1973. Nonmetallic minerals increased to $510 million in 1974 from $411 million the previous year, a rise of 24%. Nonferrous metal exports, increased during the year rising from $1.6 billion in 1973 to $2.0 billion in 1974, an increase of 25%. Export of iron and steel alloys rose 56% to $746 million. Exports of nonmetallic minerals and base metal products cumulatively totaled $394 million.

Increases in value of mineral production during 1974 were recorded by all provinces and territories with the exception of Prince Edward Island which experienced a small decline. Four provinces contributed 78.9% of the total value; Alberta was the leader followed by Ontario, British Columbia, and Quebec. Alberta generated its revenue primarily from production of crude oil, natural gas and byproducts, and coal. The revenue from fuels, $4.3 billion, was about 96% of the provincial mineral value of $4.5 billion. Of the total value of $2.4 billion from Ontario, 83% or $2.1 billion, was derived from the metallic sector. Of the Canadian total mineral production value of $11.7 billion in 1974, the percentile standing of the 10 Provinces and 2 Territories was as follows: Alberta, 38.0%; Ontario, 20.8%; British Columbia, 10.2%; Quebec, 9.9%; Saskatchewan, 7.1%; Newfoundland, 3.9%; Manitoba, 3.8%; the Northwest Territories, 2.0%; New Brunswick, 1.8%; the Yukon, 1.6%; Nova Scotia and Prince Edward Island, less than 1% each.

Exploration and development continued at a slow pace pending resolution of Federal and Provincial legislation affecting the mining industry. Exploration activity, as indicated by diamond drill footage, was curtailed in 6 of 10 Provinces and in both Territories. Total exploratory drilling dropped from 4,568,000 feet in 1973 to 4,408,000 feet in 1974. The general downturn of the economy in Canada and the rest of the world, along with continuing inflation, had a dampening effect on mineral and metal industry growth. Furthermore, as a result of worldwide concern about consumption and available resources of energy-generating minerals, much activity and effort was directed toward solving these problems. Gulf Minerals Canada Ltd. continued construction and preparatory stripping operations for uranium at Rabbit Lake, Saskatchewan. Construction of a 2,000-ton-per-day mill was near completion at yearend and mining was scheduled to begin early in 1975. Agnew Lake Mines Ltd. at Agnew Lake, Ontario, announced plans outlining a pilot plant for in situ leaching of broken ore in stopes. Overall industry plans indicate that production expansion will provide for increases from 9.4 million pounds of $U_3O_8$ in 1974 to approximately 24 million pounds by 1980.

Exploration and development activity in the petroleum, natural gas, and local industries also continued through 1974. Oil and gas operations in the Arctic Islands, the MacKenzie Delta, and offshore on the Labrador Shelf added to and expanded reserves of these commodities to a point where feasibility studies concerned with methods of transportation and processing were being expedited. In the metals field a new company, Nanisivik Mines Ltd., was established to complete development and commence mining at a discovery by Texasgulf Inc. on the nothern end of Baffin Island in the Northwest Territories. Cominco Ltd. continued work on two other base metal properties in the Northwest Territories. Bathurst Norsemines

Ltd. and the Polaris mine in the high Arctic both added to known reserves as the result of continued diamond drilling. Capital investment in other metals and minerals was directed primarily to modernization and modification of existing plants.

## PRODUCTION

Canada's mineral production was reported from 10 Provinces, the Yukon, and the Northwest Territories. The value distribution and principal minerals of each are reviewed briefly in order of descending value.

Alberta maintained its leading position as a producer of minerals contributing $4.5 billion to the economy, mostly from crude petroleum and natural gas with a lesser contribution from coal and structural materials. The value of Alberta's production increased 60% over its value in 1973 due to increased prices for oil.

Ontario, by contrast, was the major producer of metals with a total mineral production of $2.4 billion. Of this $2.1 billion was from metals, mostly nickel, copper, and zinc; $62 million from nonmetals; $8 million from fuels; and $288 million from structural materials.

British Columbia, with substantial copper production despite a declining number of mines, retained third place with a total mineral production value of $1.2 billion, of which $514 million came from copper and $90 million came from combined lead and zinc production.

Quebec produced a broad range of metals and nonmetals with a total value of $1.16 billion. Copper was valued at $248 million, asbestos $244 million, iron ore $163 million, zinc $97 million, with gold, cement, stone and titanium accounting for other substantial values.

Saskatchewan reported a 62% increase in value of mineral production from that of 1973 for a total of $834 million. Much of the increase was due to the increased price of crude oil in spite of declining production. Values were crude petroleum, $448 million; potash, $306 million; with copper, zinc, coal, natural gas, and sodium sulfate accounting for most of the balance.

Newfoundland including Labrador, produced minerals valued at $458 million with iron ore accounting for $376 million, zinc $15 million, copper $13 million, and asbestos $18 million.

Manitoba's mineral production provided a gross value of $448 million, 6% greater than that of 1973. A decline of 14% in nickel production was offset by increased zinc production. Major metal values were nickel, $215 million; copper, $83 million; and zinc, $61 million. Crude oil production in Manitoba was valued at $27 million.

The Northwest Territories mineral output increased by 38% to $230 million. Zinc, lead, gold, and silver were the major contributors, valued at $138 million, $38 million, $28 million and $20 million, respectively. All four metals showed increases in volume as well as value. Petroleum and natural gas, although having great potential in the Territories, was valued at only $5 million.

New Brunswick announced that 1974 production reached a new high value, $221 million compared with $164 million in 1973. Metals dominated the list for a total of $188 million; $123 million in zinc, $21 million in lead, $20 million in silver and $18 million in copper with an additional $6 million from antimony, bismuth, cadmium and gold. Brunswick Mining & Smelting Corp. Ltd. and Heath Steele Mines Ltd. were the major producers.

Yukon Territory continued to be a major source of metals, producing $69 million in zinc, $44 million in lead, $29 million in silver, $18 million in copper, and $4 million in gold values. Asbestos production was valued at $22 million and the total 1974 production for the Territory was $187 million compared with $152 million in 1973.

Nova Scotia's mineral output valuation increased in 1974 to $82 million from $62 million in 1973. Most of the production was from nonmetallic minerals, coal and structural materials, although exploration for metals was proceeding with encouraging results.

Prince Edward Island produced structural materials valued at $1.6 million with no metal, nonmetal, or fuel production.

## Table 1.—Canada: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Alumina, gross weight ---- thousand tons -- | 1,149 | 1,134 | e 1,200 |
| Metal, refined ---- do ---- | r 918 | 942 | 1,007 |
| Antimony [1] ---- | r 308 | 860 | e 1,250 |
| Arsenic, white ---- | 27 | -- | -- |
| Bismuth [2] ---- | 125 | 32 | 16 |
| Cadmium [3] ---- | 1,936 | 1,904 | 1,777 |
| Calcium ---- kilograms -- | 212,906 | 295,706 | 461,757 |
| Cobalt: | | | |
| Mine output, Co content [4] ---- | 1,520 | 1,517 | 1,923 |
| Metal [5] ---- | 1,200 | 605 | 973 |
| Columbium and tantalum: | | | |
| Columbium concentrate (pyrochlore), $Cb_2O_5$ content ---- | 1,757 | 1,441 | 1,866 |
| Tantalum concentrate, $Ta_2O_5$ content ---- | 112 | 77 | 195 |
| Copper: | | | |
| Mine output, recoverable Cu content ---- | 719,673 | 823,943 | 842,868 |
| Blister and anode ---- | 473,732 | 494,998 | 537,045 |
| Refined ---- | 495,945 | 497,481 | 559,125 |
| Gold ---- thousand troy ounces -- | 2,079 | 1,954 | 1,718 |
| Iron and steel: | | | |
| Iron ore ---- thousand tons -- | r 38,734 | 47,498 | 47,370 |
| Pig iron ---- do ---- | 8,495 | 9,535 | 9,422 |
| Ferroalloys ---- do ---- | 227 | 201 | e 250 |
| Crude steel ---- do ---- | 11,860 | 13,386 | e 13,450 |
| Semimanufactures (shipments) [6] ---- do ---- | 8,997 | 9,487 | e 9,550 |
| Lead: | | | |
| Mine output, Pb content ---- | r 370,029 | 387,768 | 331,123 |
| Refined, primary ---- | 186,860 | 186,891 | 125,192 |
| Magnesium, primary ---- | 5,374 | 6,205 | 5,928 |
| Mercury ---- 76-pound flasks -- | 14,687 | 12,500 | 14,000 |
| Molybdenum ---- | 12,924 | 13,785 | 13,428 |
| Nickel: | | | |
| Mine output, Ni content [7] ---- | 234,949 | 249,047 | 262,243 |
| Smelter ---- | r 133,951 | 150,181 | 177,003 |
| Platinum-group metals ---- troy ounces -- | 406,048 | 354,223 | 360,000 |
| Selenium, refined ---- kilograms -- | r s 326,764 | s 263,327 | p 268,073 |
| Silver ---- thousand troy ounces -- | 44,792 | 47,488 | 43,765 |
| Tellurium, refined ---- kilograms -- | r s 26,511 | s 42,277 | p 24,494 |
| Tin, mine output, Sn content ---- long tons -- | 157 | 130 | 138 |
| Titanium: | | | |
| Ilmenite, gross weight ---- thousand tons -- | 2,049 | 2,082 | 2,017 |
| Sorel slag (70%–72% $TiO_2$) ---- | r 834,988 | 855,207 | 844,744 |
| Tungsten, mine output, metal content ---- | 1,600 | 1,669 | 1,275 |
| Uranium ($U_3O_8$) ---- | 4,428 | 4,317 | 4,265 |
| Yttrium ($Y_2O_3$) shipments ---- | -- | NA | NA |
| Zinc: | | | |
| Mine output, Zn content ---- thousand tons -- | 1,129 | 1,227 | 1,160 |
| Refined, primary ---- | 476,168 | 532,553 | 465,436 |
| **NONMETALS** | | | |
| Asbestos ---- thousand tons -- | 1,530 | 1,690 | 1,655 |
| Barite ---- | 70,090 | 92,152 | e 114,214 |
| Cement, hydraulic [10] ---- thousand tons -- | 9,050 | 10,093 | 10,258 |
| Clays and products [11] ---- value, thousands -- | r $52,357 | $61,170 | $68,490 |
| Diatomite (shipments) ---- | NA | NA | -- |
| Feldspar (shipments) ---- | 10,600 | -- | -- |
| Fluorspar ---- | 163,000 | 137,000 | e 136,000 |
| Gypsum and anhydrite ---- thousand tons -- | 7,348 | 7,611 | 7,471 |
| Lime ---- do ---- | 1,570 | 1,715 | 1,894 |
| Magnesite and brucite ---- value, thousands -- | $2,929 | $2,656 | $3,000 |
| Nepheline syenite ---- | 507,555 | 516,554 | 550,661 |
| Potash (shipments), $K_2O$ equivalent ---- thousand tons -- | 3,495 | 4,454 | 5,508 |
| Pyrite and pyrrhotite: | | | |
| Gross weight ---- | 114,212 | 23,300 | 44,452 |
| Sulfur content ---- | r 62,186 | 12,582 | 24,004 |
| Salt ---- thousand tons -- | 4,914 | 5,048 | 5,175 |
| Sand and gravel ---- do ---- | 204,293 | 211,793 | 219,720 |
| Sodium sulfate ---- | 460,192 | 492,923 | 547,940 |
| Stone [12] ---- thousand tons -- | 72,759 | 83,365 | 86,001 |
| Strontium minerals, celestite e ---- | 59,000 | 59,000 | 59,000 |
| Sulfur, elemental byproduct: | | | |
| From smelter gases ---- thousand tons -- | 616 | 686 | 723 |
| From sour natural gas ---- do ---- | 6,723 | 7,180 | 6,948 |
| From refineries ---- do ---- | 138 | 152 | 163 |
| From tar sands ---- do ---- | 87 | 97 | 97 |
| Talc, soapstone and pyrophyllite (shipments) ---- | 78,433 | 73,931 | 84,368 |

See footnotes at end of table.

## Table 1.—Canada: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| **MINERAL FUELS AND RELATED MATERIALS** | | | | |
| Carbon black e | | 89,000 | 117,000 | 113,000 |
| Coal: | | | | |
| Bituminous and subbituminous | thousand tons | r 15,809 | 16,818 | 17,382 |
| Lignite | do | r 2,978 | 3,654 | 3,485 |
| Coke, high temperature | do | 4,724 | 5,371 | 5,450 |
| Gas, natural: | | | | |
| Gross production | million cubic feet | 3,316,153 | 3,587,000 | 3,566,650 |
| Marketed production | do | 2,913,537 | 3,119,461 | 3,083,378 |
| Natural gas liquids: | | | | |
| Gross production: | | | | |
| Butane | thousand 42-gallon barrels | r 19,896 | 22,591 | 22,135 |
| Propane | do | r 30,379 | 33,770 | 33,105 |
| Pentanes plus | do | r 59,756 | 60,694 | 58,053 |
| Condensate | do | 1,073 | 1,365 | 1,175 |
| Total | do | r 111,104 | 118,420 | 114,468 |
| Production returned to formation, all types | do | 1,276 | 492 | NA |
| Peat moss | thousand tons | 341 | 326 | 355 |
| Petroleum: | | | | |
| Crude | thousand 42-gallon barrels | r 560,740 | 654,486 | 616,532 |
| Refinery products: | | | | |
| Gasoline, aviation | do | 1,290 | 1,335 | 1,413 |
| Gasoline other | do | 182,434 | 200,791 | 212,348 |
| Jet fuel | do | 17,804 | 21,279 | 23,713 |
| Kerosine | do | 23,141 | 26,236 | 25,555 |
| Distillate fuel oil | do | 146,620 | 163,843 | 164,733 |
| Residual fuel oil | do | 107,498 | 114,438 | 128,151 |
| Lubricants | do | 2,976 | 3,415 | 4,335 |
| Other: | | | | |
| Liquefied petroleum gas | do | 6,300 | 7,529 | 8,096 |
| Petrochemical feedstocks | do | 4,489 | 7,180 | 10,390 |
| Asphalt | do | 16,500 | 17,963 | 18,103 |
| Petroleum coke | do | 766 | 1,165 | 1,103 |
| Unspecified products | do | 14,817 | 11,336 | 15,407 |
| Refinery fuel and losses | do | 39,771 | 37,446 | 37,977 |
| Total | do | 564,406 | 613,956 | 646,324 |

e Estimate. r Revised. p Preliminary. NA Not available.

[1] Antimony content of antimonial lead alloys, flue dust and dore slag.

[2] Refined metal and bullion plus recoverable bismuth content of concentrates exported.

[3] Refined metal from domestic ores plus cadmium content of some exported ores and concentrates.

[4] Actual output not reported; figure represents cobalt content of all products including cobalt in nickel sinter shipped to the United Kingdom by International Nickel Co., for further processing and cobalt in nickel-copper matte shipped to Norway by Falconbridge.

[5] Total cobalt content of all products produced less the amount of cobalt metal reported as produced in Norway. Thus, this figure includes cobalt content of cobalt oxide produced in Canada for sale as such as well as cobalt metal and/or chemicals.

[6] Includes shipments of ingots from primary plants for rolling elsewhere.

[7] Refined nickel plus nickel content of oxide produced plus recoverable nickel in matte exported.

[8] Refinery output from all sources, including imports and secondary sources.

[9] Recoverable content of blister copper treated at domestic refineries, plus refined metal from domestic primary material.

[10] Cement shipped and/or used by producers.

[11] Includes value of bentonite and products from common clay, stoneware clay, fire clay and other types of clay.

[12] Crushed, building, ornamental, paving and other similar uses.

## TRADE

Data prepared by the External Trade Division, Statistics Canada, indicated that Canada's export and import commerce established record values of $32.4 billion and $31.9 billion, respectively, in 1974 corresponding to increases of 26% and 35% over the previous year. Despite a decline in the physical volume of exports (7%) and a moderate increase in imports (3.5%), prevailing high prices in the world market were strong enough to establish new peak revenues.

Exports from the minerals sector, including metals, nonmetals, fossil fuels, and fabricated materials totaled $10.9 billion, approximately 34% of all Canadian exports. When compared with 1973 exports this represents a rise of $3.5 billion or an increase of 47%. All major categories in the minerals field recorded increases in export value during 1974. The United States continued to be Canada's largest customer in terms of total exports totaling $21.5 billion. It was followed by Japan, $2.2 billion; the European Economic Community (EEC) countries, $2.0 billion; and the United Kingdom, $1.1 billion. Latin America also increased purchases from Canada during 1974 with Brazil, Venezuela, and Mexico accounting for over $738 million.

During 1974, imports also increased in value to about $6.6 million in the minerals area. In terms of dollars the increase amounted to $3.2 billion, some 92% above the 1973 total. All of the mineral categories registered strong gains with petroleum and natural gas accounting for $2.6 billion. Iron and steel alloys also increased 93% over 1973 to $1.3 billion. Principal countries supplying Canadian imports in declining order of value were the United States, $21.3 billion; EEC and Commonwealth countries, $3.7 billion; Japan, $1.4 billion; and Venezuela, $1.3 billion.

**Table 2.—Canada: Exports of mineral commodities**

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Alumina (excluding abrasive grades, Al content) | 22,069 | 28,992 | United States 22,404; France 1,393; Italy 1,383. |
| Metal: | | | |
| Scrap | 53,998 | 51,599 | United States 36,851; Japan 3,634; West Germany 3,358. |
| Unwrought | 698,670 | 698,469 | United States 384,359; Japan 84,408; United Kingdom 63,245. |
| Semimanufactures [1] | r 36,332 | 28,484 | United States 17,392; Portugal 1,182; Mexico 1,070. |
| Cadmium | 1,026 | 1,479 | United States 909; United Kingdom 555. |
| Calcium kilograms | 114,804 | 165,606 | United States 59,511; Mexico 53,388; West Germany 43,363. |
| Cobalt: | | | |
| Metal | 890 | 551 | United States 529; France 6; United Kingdom 6. |
| Oxides and salts, gross weight | r 733 | 512 | United Kingdom 433; United States 79. |
| Columbium concentrate [2] kilograms | r 29,535 | 303 | All to United States. |
| Copper: | | | |
| Ore and matte, Cu content | 270,334 | 345,421 | Japan 297,377; Norway 22,673; United States 13,454. |
| Slag, skimmings and sludge, Cu content | 132 | 2,559 | United Kingdom 1,991; France 449; United States 46. |
| Metal: | | | |
| Scrap: | | | |
| Unalloyed | 19,030 | 24,938 | United States 10,222; Belgium-Luxembourg 2,509; West Germany 2,461. |
| Copper alloys | 16,297 | 24,618 | United States 11,130; West Germany 3,901; Japan 2,770. |
| Unwrought, unalloyed | 293,421 | 287,468 | United States 114,728; United Kingdom 92,101; West Germany 27,032. |

See footnotes at end of table.

## Table 2.—Canada: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Copper—Continued | | | |
| Metal—Continued | | | |
| Semimanufactures: [1] | | | |
| Unalloyed | 38,553 | 49,044 | United States 22,330; United Kingdom 7,168; Lebanon 2,225. |
| Copper alloys | r 16,368 | 16,505 | United States 13,995; Japan 900; United Kingdom 366. |
| Iron and steel: | | | |
| Iron ore thousand tons | 29,275 | 37,668 | United States 21,651; United Kingdom 4,880; Japan 3,680. |
| Pig iron and related materials do | 651 | 618 | United States 369; Netherlands 130; Italy 50. |
| Ferroalloys: | | | |
| Ferromanganese | 2,067 | 3,024 | United States 2,882. |
| Ferrosilicon | 44,292 | 45,211 | United States 20,881; United Kingdom 18,423. |
| Other | 2,630 | 5,698 | United States 1,688; United Kingdom 1,487. |
| Steel ingots and other primary forms | 117,481 | 123,804 | United States 53,566; Iran 49,486. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, and sections | 343,533 | 309,607 | United States 224,231; United Kingdom 13,752; France 12,625. |
| Universals, plates, sheets and strip | 751,661 | 673,006 | United States 445,582; United Kingdom 31,420; Italy 30,629. |
| Rails and accessories | 73,112 | 124,225 | United States 52,872; Mexico 36,136; People's Republic of China 12,979. |
| Wire | 35,744 | 54,473 | United States 53,206; New Zealand 470; Pakistan 140. |
| Tubes, pipes, and fittings | 124,051 | 196,427 | United States 183,806; Barbados 2,210; Nigeria 1,510. |
| Castings and forgings, rough | 130,180 | 216,183 | United States 213,564; United Kingdom 789; Mexico 778. |
| Lead: | | | |
| Ore and concentrate, metal content | 162,001 | 193,412 | Japan 123,045; West Germany 22,251; United States 20,936. |
| Metal: | | | |
| Scrap, including alloy scrap | 11,165 | 21,713 | Netherlands 12,506; Republic of Korea 3,055; France 1,775. |
| Unwrought, unalloyed | 127,769 | 113,562 | United Kingdom 49,540; United States 47,988; India 4,582. |
| Semimanufactures [1] | 6,210 | 9,067 | United States 8,702; United Kingdom 146. |
| Magnesium metal | 2,606 | 2,961 | United Kingdom 863; People's Republic of China 768; United States 487. |
| Mercury [2] 76-pound flasks | 18,803 | 17,440 | All to United States. |
| Molybdenum ore and concentrate, Mo content [3] | 14,211 | 11,164 | Belgium-Luxembourg 4,056; Japan 3,256; West Germany 530. |
| Nickel: | | | |
| Ore, matte and speiss, Ni content | 100,998 | 91,068 | Norway 41,728; United Kingdom 34,060; Japan 15,073. |
| Oxide, Ni content | 33,236 | 59,710 | United States 36,664; Belgium-Luxembourg 7,109; United Kingdom 4,545. |
| Metal: | | | |
| Scrap | 1,934 | 2,187 | United States 1,475; Italy 284; Republic of Korea 201. |
| Unwrought | 109,678 | 125,161 | United States 74,929; People's Republic of China 22,543; United Kingdom 14,273. |
| Semimanufactures [1] | 4,143 | 6,619 | United States 3,801; United Kingdom 1,571; Italy 324. |
| Platinum-group metals: | | | |
| Concentrates, residues and matte, metal content troy ounces | 556,279 | 447,138 | United Kingdom 432,312; Norway 14,623. |
| Metal: | | | |
| Scrap do | 39,033 | 31,646 | United States 26,130; United Kingdom 5,516. |
| Other do | r 19,536 | 13,459 | United States 8,668; United Kingdom 4,667. |

See footnotes at end of table.

## Table 2.—Canada: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Selenium metals and salts, Se content kilograms | 228,978 | 373,352 | United States 227,612; United Kingdom 96,887. |
| Silver: | | | |
| Ore and concentrate, Ag content thousand troy ounces | 22,199 | 26,009 | United States 13,397; Japan 6,112; West Germany 3,299. |
| Metal, refined do | 19,825 | 22,905 | United States 20,976; Belgium-Luxembourg 1,534; Trinidad and Tobago 207. |
| Tin ore and concentrate, Sn content[3] long tons | 140 | 313 | United States 167; United Kingdom 100; Mexico 45. |
| Titanium: | | | |
| Ilmenite and ilmenite sand[2 4] | r 191,754 | 200,252 | All to United States. |
| Titanium slag 70% $TiO_2$[2] | 153,611 | 91,015 | Do. |
| Uranium and thorium concentrates value, thousands | r $39,855 | $64,150 | United States $46,794; United Kingdom $17,356. |
| Zinc: | | | |
| Ore and concentrate, Zn content | 695,087 | 838,660 | Belgium-Luxembourg 267,271; Japan 192,299; United States 122,588. |
| Metal: | | | |
| Scrap, dross, ashes, and blue powder | 8,975 | 12,150 | United States 6,054; Belgium-Luxembourg 1,863; Netherlands 1,462. |
| Unwrought | 370,412 | 420,681 | United States 316,123; United Kingdom 62,961; Brazil 5,149. |
| Semimanufactures[1] | 6,601 | 4,712 | United States 3,697; United Kingdom 373; Japan 250. |
| Other, n.e.s.: | | | |
| Ore and concentrate, gross weight | 341,967 | 718,460 | Netherlands 260,973; United States 187,033; United Kingdom 154,373. |
| Ash and residue containing nonferrous metals | 1,160 | 5,053 | United States 4,679; United Kingdom 160; Japan 67. |
| Oxides, hydroxides and peroxides of metals | 68,761 | 82,859 | United States 75,658; United Kingdom 1,511; Venezuela 1,479. |
| Metals: | | | |
| Base metals, including alloys, all forms | 707 | 863 | United States 664; United Kingdom 73; Australia 30. |
| Precious metals[5] troy ounces | 43 | 22,405 | United Kingdom 17,750; United States 3,194; Italy 1,197. |
| NONMETALS | | | |
| Abrasives: | | | |
| Natural | 78 | 30 | United States 24; Chile 6. |
| Fused alumina, crude and grains | 160,001 | 171,322 | United States 155,236; United Kingdom 16,086. |
| Silicon carbide, crude and grains | r 94,699 | 92,983 | Mainly to United States. |
| Grinding and polishing wheels and stones value, thousands | $504 | $1,168 | United States $699; Australia $152. |
| Asbestos: | | | |
| Crude | 50 | 32 | United States 11; Japan 9; Italy 5. |
| Milled fiber, all grades thousand tons | 1,450 | 1,683 | United States 700; Japan 144; West Germany 129. |
| Barite, crude | 18,314 | 45,370 | All to United States. |
| Cement, portland thousand tons | 1,138 | 1,279 | Mainly to United States. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, including refractory clay do | 887 | 1,060 | Do. |
| Products: | | | |
| Refractory (including nonclay bricks) value, thousands | $8,770 | $12,585 | United States $8,225. |
| Nonrefractory do | $2,038 | $2,344 | United States $2,295. |
| Diamond: | | | |
| Gem, not set or strung carats | 188 | -- | |
| Industrial dust and powder do | 763 | -- | |

See footnotes at end of table.

## Table 2.—Canada: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials: | | | |
| Nitrogenous ____ thousand tons __ | 835 | 772 | United States 766. |
| Potassic _____ do ____ | 5,750 | 7,129 | United States 5,218; Japan 602; Belgium-Luxembourg 354. |
| Mixed _____ do ____ | 846 | 764 | United States 596; Lebanon 72. |
| Ammonia _____ do ____ | 78 | 64 | Mainly to United States. |
| Gypsum, crude _____ do ____ | 5,410 | 5,754 | United States 5,678; Bahamas 76. |
| Lime _____ | 268,650 | 338,454 | United States 337,587; Greenland 620. |
| Nepheline syenite _____ | 397,714 | 406,835 | United States 396,837; United Kingdom 2,749; Australia 2,264. |
| Pigments, mineral, including processed iron oxides _____ | 12,193 | 16,653 | United States 15,267; Poland 325; Italy 322. |
| Precious and semiprecious stones, except diamond __ value, thousands __ | $224 | $348 | United States $124; Hong Kong $70 Japan $39. |
| Salt and brine _____ do ____ | r $5,032 | $6,051 | United States $5,948; United Kingdom $61. |
| Sand and gravel ____ thousand tons __ | 632 | 799 | Mainly to United States. |
| Sodium sulfate _____ | 118,988 | 143,037 | United States 140,029; Philippines 2,496. |
| Stone: | | | |
| Limestone, crude, crushed and refuse _____ thousand tons __ | 1,552 | 1,534 | Mainly to United States. |
| Quartzite _____ do ____ | 125 | 103 | Do. |
| Rough building and crude, n.e.s do ____ | 626 | 362 | Do. |
| Sulfur: | | | |
| Crude and refined _____ do ____ | 2,584 | 3,492 | United States 953; Australia 487; People's Republic of China 277. |
| Sulfuric acid and oleum __ do ____ | 95 | 123 | Mainly to United States. |
| Talc, steatite, soapstone, and pyrophyllite [2] _____ | r 6,054 | 7,641 | All to United States. |
| Other nonmetals, crude, n.e.s. value, thousands __ | $38,168 | $48,001 | United States $14,970; West Germany $9,231; France $4,428. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal, bituminous ____ thousand tons __ | 7,723 | 10,908 | Japan 10,625; United States 167; Chile 104. |
| Coke from coal _____ | 238,478 | 367,916 | United States 275,334; West Germany 49,940; Romania 25,222. |
| Fuel briquets, coal and coke _____ | 37,377 | 25,060 | All to United States. |
| Natural gas ____ million cubic feet __ | 1,007,054 | 1,030,913 | Do. |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels __ | 341,253 | 420,060 | Do. |
| Refinery products: | | | |
| Gasoline _____ do ____ | 487 | 4,663 | United States 4,449; Mexico 201. |
| Distillate fuel oil ____ do ____ | 4,232 | 5,108 | United States 4,412; St. Pierre-Miquelon 476; Netherlands 135. |
| Residual fuel oil _____ do ____ | 32,178 | 36,262 | United States 35,844; Sweden 250; United Kingdom 150. |
| Lubricants _____ do ____ | 11 | 18 | United States 9; St. Pierre-Miquelon 4. |
| Other: | | | |
| Liquefied petroleum gas do ____ | 31,323 | 36,229 | United States 33,033; Japan 3,194. |
| Asphalt _____ do ____ | 424 | 514 | United States 507; United Kingdom 5. |
| Petroleum coke and pitch coke _____ do ____ | 5 | 11 | All to United States. |
| Total _____ do ____ | 68,660 | 82,805 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals _____ | r 4,242 | 3,036 | United States 2,834; Puerto Rico 182. |

r Revised.

[1] May include relatively minor quantities of certain shapes not normally included among semimanufactures.

[2] Partial figures, data given are U.S. imports for consumption only.

[3] Includes some scrap.

[4] Largely, if not all, used in the production of heavy aggregate.

[5] Excludes scrap and sweepings valued in thousands at $3,826 in 1972 and $7,308 in 1973.

## Table 3.—Canada: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite ——— thousand tons | 2,623 | 2,638 | Guyana 1,415; Surinam 422; Sierra Leone 357. |
| Alumina ——— do | 673 | 853 | Australia 334; United States 284; Jamaica 215. |
| Metal including alloys: | | | |
| Scrap | 7,420 | 10,286 | United States 10,263. |
| Unwrought | 34,746 | 44,938 | United States 33,165; United Kingdom 8,807. |
| Semimanufactures (including cable) | 93,084 | 107,150 | United States 100,389; United Kingdom 2,111; Belgium-Luxembourg 1,823. |
| Antimony oxides | 467 | 675 | United Kingdom 509; United States 143. |
| Chromium: | | | |
| Ore and concentrate, Cr content | 22,433 | 25,036 | Philippines 10,685; United States 8,597; Cyprus 3,412. |
| Oxide and hydroxide | 1,065 | 1,468 | France 577; United States 564. |
| Copper: | | | |
| Ore and concentrate (including scrap), Cu content | 19,632 | 52,833 | United States 23,830; Chile 16,517; Peru 6,610. |
| Copper sulfate | 1,572 | 1,298 | Belgium-Luxembourg 724; United States 317. |
| Metal: | | | |
| Unalloyed: | | | |
| Unwrought | 16,185 | 17,179 | United States 14,626; Netherlands 1,605; Chile 462. |
| Semimanufactures | r 5,199 | 7,502 | United States 5,852; Chile 740; Japan 487. |
| Alloys, unwrought and semimanufactures (including cable) [1] | r 17,763 | 17,618 | United States 12,692; United Kingdom 1,716; Netherlands 1,298. |
| Iron and steel: | | | |
| Iron ore ——— thousand tons | 1,753 | 2,689 | United States 2,172; Brazil 484. |
| Scrap ——— do | 1,111 | 914 | Mainly from United States. |
| Pig iron and related materials | 7,381 | 6,764 | Do. |
| Ferroalloys: | | | |
| Ferrochrome | 13,793 | 34,727 | Republic of South Africa 22,808; United States 6,719. |
| Ferromanganese (includes spiegeleisen) | 17,141 | 24,050 | United States 11,004; France 5,092; Norway 4,601. |
| Silicomanganese (includes silicospiegeleisen) | 15,093 | 9,752 | United States 6,609; Norway 1,100; Republic of South Africa 1,041. |
| Ferrosilicon | 8,676 | 12,920 | Yugoslavia 5,420; United States 4,133; Norway 2,284. |
| Ferrotungsten | 115 | 78 | Mainly from United Kingdom. |
| Ferrovanadium | 105 | 152 | All from United States. |
| Other | 12,558 | 29,868 | Greece 16,491; Republic of South Africa 4,078; United States 4,028. |
| Steel, primary forms | 243,294 | 86,408 | United States 75,582; France 6,092. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, and sections: | | | |
| Wire rod | 219,122 | 211,261 | Czechoslovakia 59,385; Japan 57,632; France 41,214. |
| Other bars and rod [1] | 212,732 | 237,475 | United States 162,924; Japan 20,424; United Kingdom 13,931. |
| Angles, shapes, and sections | 292,964 | 388,752 | United States 178,893; United Kingdom 67,235; Belgium-Luxembourg 50,909. |
| Universals, plates, sheets, and strip | 977,812 | 875,507 | United States 375,243; Japan 297,864; West Germany 108,505. |
| Rails and accessories | 9,290 | 15,457 | United States 14,033; United Kingdom 654. |
| Wire | 59,360 | 68,265 | United Kingdom 22,443; United States 12,357; Japan 11,652. |
| Tubes, pipes, and fittings | 233,637 | 245,741 | Japan 106,871; United States 105,611; United Kingdom 11,821. |
| Castings and forgings | r 188,176 | 138,556 | United States 127,195; United Kingdom 7,731; Spain 842. |
| Lead: | | | |
| Oxide | 2,160 | 1,810 | Mexico 1,259; United States 486. |
| Metal including alloys, unwrought and semimanufactures [1] | 10,745 | 4,771 | United States 4,708. |

See footnotes at end of table.

## Table 3.—Canada: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Magnesium metal including alloys | r 4,362 | 5,086 | United States 4,975; United Kingdom 110. |
| Manganese: | | | |
| Ore and concentrate, Mn content | 89,065 | 132,047 | United States 43,565; Gabon 34,930; Brazil 23,205. |
| Metal | 2,957 | 4,204 | Republic of South Africa 3,106; United States 770. |
| Mercury 76-pound flasks | r 2,299 | 1,397 | United States 570; Netherlands 386; Spain 309. |
| Molybdenum, molybdic oxide, gross weight | 12 | 90 | All from United States. |
| Nickel: | | | |
| Ore and concentrate (including scrap), Ni content | 22,125 | 11,543 | United States 3,534; United Kingdom 3,255; New Caledonia 2,462. |
| Metal including alloys: | | | |
| Unwrought | 16,329 | 14,643 | Norway 12,308; U.S.S.R. 1,364; United Kingdom 454. |
| Semimanufactures [1] | 3,713 | 4,698 | United States 3,772; United Kingdom 740; West Germany 171. |
| Platinum-group metals troy ounces | 47,719 | 63,952 | United Kingdom 34,619; United States 13,359; Republic of South Africa 11,101. |
| Silver metal thousand troy ounces | 1,117 | 8,755 | United States 7,322; United Kingdom 879; Mexico 539. |
| Sodium metal | 8,164 | 9,622 | United States 9,535. |
| Tin metal, unwrought and semimanufactures [1] long tons | r 5,855 | 5,501 | Malaysia 3,428; United States 1,123; People's Republic of China 493. |
| Titanium: | | | |
| Dioxide, pure and extended | 6,427 | 4,684 | United States 1,983; West Germany 1,315; United Kingdom 1,239. |
| Metal | 202 | 252 | United States 207; Japan 40. |
| Tungsten ore and concentrate, W content | 109 | 5 | All from United States. |
| Zinc: | | | |
| Ore and concentrate (including scrap), Zn content | 308 | 3,709 | Do. |
| Oxide and peroxide | 2,411 | 2,208 | United States 1,660; United Kingdom 296; Mexico 191. |
| Metal: | | | |
| Blue powder | 1,216 | 814 | All from United States. |
| Unwrought | 11,337 | 18,521 | Belgium-Luxembourg 11,925; Netherlands 3,628; United States 1,868. |
| Semimanufactures [1] | 1,257 | 1,346 | United States 1,092; United Kingdom 110; West Germany 71. |
| Zirconium metal alloys | 149 | 140 | United States 126. |
| Other: | | | |
| Ores and concentrates (including scrap), gross weight | 115,284 | 164,109 | United States 62,800; Chile 39,741; Australia 32,588. |
| Oxides, hydroxides and peroxides of metals | 4,917 | 23,882 | Ghana 18,594; United States 4,663; Republic of South Africa 208. |
| Metals: | | | |
| Base metals including alloys, all forms | 1,990 | 2,222 | United States 792; Norway 600; Finland 428. |
| Precious metals [1] troy ounces | 54,819 | 46,446 | United States 36,012; United Kingdom 4,566; West Germany 2,642. |
| NONMETALS | | | |
| Abrasives: | | | |
| Natural | 10,914 | 12,918 | United States 12,517; Netherlands 299. |
| Grinding and polishing wheels and stones value, thousands | $5,199 | $5,152 | United States $4,202; West Germany $252; United Kingdom $204. |
| Asbestos | 5,952 | 4,499 | Republic of South Africa 3,263; United States 1,010. |
| Barite, crude | 19,779 | 28,649 | United States 28,581; People's Republic of China 68. |
| Cement | r 54,929 | 121,289 | United States 111,667; Belgium-Luxembourg 3,342; United Kingdom 2,919. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 277,804 | 205,179 | United States 185,874; Greece 19,305. |

See footnotes at end of table.

## Table 3.—Canada: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Clays and clay products (including all refractory brick)—Continued | | | |
| Crude clays, n.e.s—Continued | | | |
| Fire clay | 44,769 | 31,868 | All from United States. |
| Fuller's earth | 6,372 | 12,310 | Do. |
| Kaolin (china clay) | 210,500 | 185,455 | United States 149,291; United Kingdom 36,164. |
| Other (including refractory clay) | 75,885 | 93,584 | United States 93,476; United Kingdom 104. |
| Products: | | | |
| Refractory (including nonclay bricks) - value, thousands | $28,028 | $35,149, | United States $31,584; United Kingdom $1,110; West Germany $669. |
| Nonrefractory do | $13,775 | $15,957 | Japan $5,334; Italy $2,885; United States $2,682. |
| Cryolite, crude | 828 | 4,977 | Denmark 4,893; United States 84. |
| Diamond: | | | |
| Gem, not set or strung -- carats | 103,787 | 116,250 | Israel 48,006; Belgium-Luxembourg 38,718; Netherlands 7,324. |
| Industrial do | 865,735 | 887,024 | United States 783,631; Belgium-Luxembourg 43,703; United Kingdom 24,575. |
| Dust and powder do | 383,683 | 454,129 | United States 441,229; Ireland 7,100; Denmark 3,100. |
| Diatomite and other infusorial earth | 31,196 | 34,012 | All from United States. |
| Fertilizer materials: | | | |
| Nitrogenous | 62,299 | 59,195 | United States 47,663; Chile 7,016; Belgium-Luxembourg 2,485. |
| Phosphatic: | | | |
| Phosphate rock thousand tons | 2,729 | 3,286 | United States 3,279. |
| Other | 98,126 | 59,718 | United States 58,707; United Kingdom 502. |
| Potassic | 26,157 | 44,829 | United States 44,762. |
| Other, including mixed | 63,299 | 88,547 | United States 88,369. |
| Fluorspar | 65,236 | 153,816 | Mexico 91,542; United Kingdom 35,470; Spain 16,869. |
| Gypsum | 56,593 | 83,725 | Mexico 76,280; United States 6,612. |
| Iodine | 181 | 159 | Japan 151. |
| Lime | 26,017 | 14,740 | United States 14,703; France 37. |
| Magnesium: | | | |
| Dolomite, calcined | 1,585 | 1,328 | All from United States. |
| Dead burned or sintered | 50,747 | 53,708 | United States 39,732; France 7,402; Japan 4,449. |
| Other | 1,819 | 1,759 | United States 1,563; United Kingdom 195. |
| Mica, crude | 4,700 | 5,786 | United States 5,725. |
| Pigments, mineral, including processed iron oxides | 5,540 | 6,330 | United States 3,823; West Germany 1,668; Spain 560. |
| Precious and semiprecious stones, except diamond - value, thousands | $5,120 | $6,386 | United States $1,943; United Kingdom $908; West Germany $684. |
| Salt and brine | 928,876 | 830,179 | United States 518,198; Mexico 280,648; Bahamas 24,659. |
| Sodium carbonate (including sal soda) | 197,735 | 179,189 | United States 173,400; France 5,754. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 154,126 | 162,333 | United States 104,442; Netherlands 20,522; Belgium-Luxembourg 16,673. |
| Caustic potash, sodic and potassic peroxides | 1,644 | 1,740 | United States 1,550; Italy 92. |
| Sodium sulfate (Glauber's salt) | 24,458 | 27,038 | United States 12,863; Belgium-Luxembourg 11,605; United Kingdom 2,570. |
| Stone, sand and gravel: | | | |
| Stone: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 24,476 | 32,955 | United States 18,651; Republic of South Africa 10,331; Italy 2,751. |
| Worked value, thousands | $2,809 | $2,735 | United States $1,850; Italy $708. |
| Limestone thousand tons | 1,645 | 2,124 | All from United States. |
| Pumice and lava | 15,339 | 17,179 | Greece 14,008; United States 2,863. |
| Quartz, silex and crystallized | 8 | 991 | All from United States. |
| Other, including crushed and broken | 62,515 | 56,225 | United States 55,125; Italy 680. |
| Sand and gravel: | | | |
| Silica sand thousand tons | 1,242 | 986 | Mainly from United States. |
| Other do | 969 | 1,031 | Do. |

## Table 3.—Canada: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Sulfur: | | | |
| Elemental | 25,494 | 35,759 | United States 35,707; France 52. |
| Sulfuric acid (including oleum) | 63,604 | 65,727 | Sweden 44,299; Finland 15,554; United States 5,874. |
| Talc, steatite, soapstone, and pyrophyllite | 36,746 | 29,967 | United States 29,781. |
| Vermiculite, crude | 33,286 | 39,015 | United States 32,354; Republic of South Africa 6,661. |
| Other nonmetals, n.e.s.: | | | |
| Crude value, thousands | $2,196 | $4,308 | United States $3,149; U.S.S.R. $650; Turkey $260. |
| Oxides and hydroxides of magnesium, strontium and barium | 35,338 | 54,945 | United States 54,529; United Kingdom 253. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s. value, thousands | $4,892 | $4,628 | United States $2,658; United Kingdom $1,564. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural do | r $473 | $495 | United States $456. |
| Carbon black | 8,621 | 9,088 | United States 8,933; United Kingdom 108. |
| Coal, all grades thousand tons | 17,477 | 14,946 | All from United States. |
| Coke from coal do | 462 | 358 | United States 307; West Germany 51. |
| Fuel briquets, coal and coke | 8,771 | 12,481 | All from United States. |
| Gas, natural million cubic feet | 15,760 | 14,700 | Do. |
| Hydrogen and other rare gases | 18,656 | 16,697 | United States 16,162; Italy 430. |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 281,664 | 327,564 | Venezuela 148,834; Iran 55,259; Saudi Arabia 26,170. |
| Refinery products: | | | |
| Gasoline: | | | |
| Aviation do | 146 | 112 | Netherlands Antilles 99; United States 13. |
| Motor do | 3,058 | 222 | Leeward and Windward Islands 183; Netherlands Antilles 30; United States 9. |
| Kerosine do | 339 | (2) | All from United States. |
| Jet fuel do | 2,216 | 2,462 | Netherlands Antilles 783; United States 780; Venezuela 444. |
| Distillate fuel oil do | 14,881 | 7,235 | Netherlands Antilles 2,967; Venezuela 1,804; Bahamas 984. |
| Residual fuel oil do | 26,618 | 29,051 | Venezuela 13,910; Netherlands Antilles 7,084; United States 3,967. |
| Lubricants (including grease) do | r 1,505 | 1,552 | United States 1,265; Trinidad and Tobago 183; United Kingdom 69. |
| Other: | | | |
| Liquefied petroleum gas do | 83 | 274 | Mainly from United States. |
| Naphtha do | 92 | 113 | All from United States. |
| Asphalt and road oils do | 379 | 69 | United States 68. |
| Petroleum and pitch coke do | 3,056 | 3,507 | United States 3,344; Argentina 141; United Kingdom 22. |
| Petroleum jelly and wax do | 93 | 88 | Mainly from United States. |
| Unspecified do | 1,814 | 1,355 | Puerto Rico 634; United States 527; Venezuela 108. |
| Total do | 54,280 | 46,040 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 110,458 | 95,747 | United States 51,278; Australia 21,931; United Kingdom 17,162. |

r Revised.

1 May include relatively minor quantities of certain shapes not normally included among semimanufactures.

2 Less than ½ unit.

# COMMODITY REVIEW

## METALS

**Aluminum.**—Production of primary aluminum metal during 1974, 1,007,000 tons, exceeded the production in 1973 by 7%. The surge in demand and consequent shortage experienced in 1973 carried over into the third quarter of 1974 so that in spite of a rapid softening of demand in the fourth quarter, the year as a whole yielded a near record production.

The alumina refinery of Aluminum Company of Canada Ltd. (Alcan), at Arvida, Quebec used bauxite from Guinea, Guyana, Surinam, Sierra Leone, and other countries to produce alumina for four Alcan smelters in Quebec at Isle-Maligne, Shawinigan, Beauharnois, and Arvida. During 1974 Canada imported about 1,980,000 tons of bauxite. Alcan also operated a smelter at Kitimat, British Columbia, supplied with alumina imported from Jamaica and Australia. Alcan's production of primary aluminum in 1974 was 874,000 tons.

Canadian Reynolds Metal Co. Ltd. operated a smelter at Baie Comeau, Quebec, supplied with alumina from the United States. Alumina imported from the United States totaled 174,800 tons in 1974.

Domestic primary aluminum consumption in Canada in 1974 was estimated to be 358,000 tons, an increase of 18% over 1973 consumption. Exports of aluminum ingot in 1974 reached a level of 682,000 tons, indicating a small increase over those of 1973. The United States received 55% of all aluminum exports; Japan and the United Kingdom received about 10% each.

Alcan announced a 10-year plan to expand ingot capacity by about 272,000 tons per year at a cost of $500 million to $600 million. Existing hydropower would supply half of this expansion. Modernization of other existing facilities to achieve increased efficiency would serve the other half. A 35,000-ton expansion of smelter capacity at Arvida was scheduled to be ready in 1975.

Aluminum Co. of America (Alcoa) suspended plans announced in 1973 to build a smelter in the Valleyfield, Quebec, area with a capacity of 60,000 tons per year. Canadian Reynolds Metal Co. Ltd. planned further expansion and improvement of its rolled aluminum products plant at Cape-de-la Madeleine, Quebec. Alcan and Péchiney Development, Ltd., agreed on a joint venture to develop a process for producing alumina from clays and shales, using a pilot plant near Marseilles, France.

**Columbium and Tantalum.**—Responding to strong demand in 1974, Canada's mine production of columbium concentrate (pyrochlore) grew from 1,441 tons in 1973 to 1,866 tons in 1974. The sole Canadian producer, the St. Lawrence Columbium and Metals Corp. near Oka, Quebec, exported much of its output for conversion to ferrocolumbium by foreign consumers. Some Canadian production was converted to ferrocolumbium by St. Lawrence Columbium, Masterloy Products Ltd., and Fundy Chemical International Ltd. The ore reserve at the Oka operation was enlarged during 1974 and was reported to be 25.6 million tons averaging 0.44% $Cb_2O_5$.

A possible second columbium producer, Niobec Inc., was formed in 1974 by Quebec Mining Exploration Co. (SOQUEM) and Copperfields Mining Corporation to begin production at the St. Honore, Quebec, columbium property owned 50% by SOQUEM, 25% by Copperfields, and 25% by Teck Corporation Ltd. Reserves were reported to be 40 million tons averaging 0.76% $Cb_2O_5$.

Tantalum Mining Corp. of Canada Ltd. (Tanco), produced approximately 195 tons of $Ta_2O_5$ in tantalite concentrate in 1974, a sharp increase from the reduced output of 1973. During 1974 Chemalloy Minerals Ltd., the controlling owner of Tanco, sold a 24.9% interest to Kawecki Berylco Industries, Inc.; Manitoba Development Corp., a government corporation, held a 25% interest. In February 1974, a sales contract was signed covering $18 million to $20 million in tantalum, cesium, and rubidium products over a 5-year period.

Tanco's tantalum reserves at Bernic Lake, Manitoba, were reported as 1,420,000 tons averaging 0.224% $Ta_2O_5$. Other adjoining reserves on the same group of properties contained 5 million tons containing 2.98% lithium oxide and 300,000 tons averaging 23.0% cesium oxide (pollucite).

**Copper.**—Production of recoverable copper by Canadian mines rose to a new

record of 842,400 tons in 1974, indicating a 2% increase over 1973 production despite a decline in output from the province with the largest production, British Columbia. Canada's copper production was valued at $1.4 billion, exceeding the value of any other solid mineral and surpassed in value only by Canadian petroleum production. Canada ranks third among world copper producing countries after the United States and Chile.

The supply of copper changed from scarcity to plenty midway through 1974. Prices on the London Metal Exchange (LME) peaked in April at about $1.50 per pound and dropped below $0.60 by yearend. Plans for expansion or increases in capacity were postponed not only because of slackening demand and falling prices but also due to uncertainty about new taxation measures introduced in some provinces.

British Columbia accounted for 35% of total mine production, followed by Ontario with 34%. Quebec contributed 17%, Manitoba 9%, and other Provinces and Territories 5% of the total.

Much of the copper production in Ontario and Manitoba is a coproduct from nickel mines. The International Nickel Co. of Canada Ltd. (INCO), delivered about 166,600 tons of refined copper from its refinery at Copper Cliff, Ontario, and operated 13 mines in Ontario and 3 in Manitoba. INCO reported proven ore reserves in Canada at yearend 1974 as 376 million tons of ore containing 6.1 million tons of nickel and 3.8 million tons of copper.

Falconbridge Nickel Mines Ltd. operated 9 nickel-copper mines in Ontario and Manitoba and its subsidiary Falconbridge Copper, Ltd., operated 6 copper-zinc or copper mines in Quebec, Ontario, and British Columbia. Total copper output by Falconbridge in 1974 was 69,500 tons of which about 25,500 was delivered by the nickel operations.

Falconbridge nickel ore reserves were reported to be 82 million tons of ore averaging 1.4% nickel and 0.68% copper at Sudbury, Ontario, and Manibridge, Manitoba. Falconbridge copper ore reserves were 2.2 million tons with a grade of 3.2% copper and 4.0% zinc in the Lake Dufault Division; 5.8 million tons at 2.35% copper in the Opemiska Division; and 2 million tons averaging 2.80% copper and 10.19% zinc in the Sturgeon Lake venture.

Sheritt Gordon Mines Ltd. operated the Lynn Lake mine (nickel-copper) and the Fox and Ruttan mines (copper), also in Manitoba, to produce 46,000 tons of copper in concentrates destined for smelting at Flin Flon, Manitoba, Noranda, Quebec, and Japan.

Noranda Mines Ltd., with its subsidiaries and associated companies, was the largest copper producer in Canada. Mines included in the Noranda group are those near Noranda (Horne, Geco, Normetal, Orchan, Mattagami Lake) in the Ontario-Quebec area; Gaspé mines in eastern Quebec, and several in British Columbia (Craigmont, Gilbraltar, Brenda, Bell Copper). Copper produced in concentrates from this group exceeded 205,000 tons. Copper production from the two Noranda smelters came from 983,000 tons of concentrates from 14 mines of the Noranda group and 929,300 tons of custom concentrates from 29 other Canadian mines for a total production of 307,500 tons of copper anodes. Canadian Copper Refineries Ltd. in Montreal, a 100% owned subsidiary, processed this Noranda copper anode production as well as the output of the Flin Flon smelter of Hudson Bay Mining & Smelting Co. Ltd. The total production of refined copper from Canadian Copper Refineries and from INCO in 1974 was 559,100 tons, an increase of 12% over that of 1973.

Texasgulf, Inc., operated its zinc-copper-silver mine near Timmins, Ontario, and produced 241,200 tons of copper concentrates as a coproduct with zinc, lead, and silver. Plans to construct a 130,000-ton-per-year copper smelter and to develop the deeper parts of the Kidd Creek mine which show an increased copper content, were developed and then suspended in 1974. After the Ontario Mining Tax Act was amended and the resulting regulations were published, these plans were reaffirmed early in 1975. The Canada Development Corp. (CDC), a crown corporation, acquired approximately 30% of Texasgulf shares late in 1973. At the end of 1974, ore reserves above the 2,800 level were estimated to be 85 million tons. Previous production has assayed 1.56% copper, 0.38% lead, and 9.66% zinc. Exploration by Texasgulf in Canada discovered a promising prospect in the Northwest Ter-

ritories assaying 4% copper, 4.8% zinc, and 1.0 ounce per ton silver, in addition to a possible porphyry copper deposit in north central British Columbia.

Hudson Bay Mining & Smelting operated a copper smelter as part of its metal complex at Flin Flon, Manitoba. The combined blister and anode copper production was about 49,000 tons. A new anode casting plant was put into operation in March and blister casting was discontinued. Anodes were shipped to Canadian Copper Refiners, (Noranda), for refining. Hudson Bay operated nine mines in the Flin Flon area producing 193,000 tons of copper concentrates (and about 64,000 tons of zinc and lead concentrates). The feed for the copper smelters was supplemented with 53,200 tons of residues and 84,300 tons of purchased copper concentrates. Ore reserves at the end of 1974 were reported at 16,300,000 tons—2.9% copper, 2.7% zinc, 0.03 ounce gold per ton and 0.5 ounce silver per ton.

In addition to the mines controlled by the larger copper producers many other mining companies operated to produce concentrates for Japan, the United States, and West Germany. Among the larger producers were the Buchans mine, operated by American Smelting & Refining Company (ASARCO) in Newfoundland; Caribou mines in New Brunswick operated by The Anaconda Company (Anaconda) which closed October 1, 1974; Campbell Chibougamau, Icon Sullivan, Louvem, and East Sullivan mines in Quebec; Pamour and Willroy mines in Ontario; Britannia Beach operated by Anaconda which closed November 1, 1974; Bethlehem, Similkameen, Texada, Utah and Western mines in British Columbia; the Whitehorse Copper mine in the Yukon and the Echo Bay and Terra Mining & Exploration Ltd. operations in the Northwest Territories.

**Gold.**—Canadian gold production declined for the 14th consecutive year to 1.72 million troy ounces in 1974, down from 1.93 million troy ounces in 1973. The value of gold production increased from $192 million in 1973 to $265 million in 1974 as a result of the sharp rise in the free market price of gold. The weighted average value of gold increased from Can$97.41 per troy ounce (US$97.32) in 1973 to Can$156.48 (US$160.86) in 1974. The average Royal Canadian Mint buying prices for gold were Can$38.86 in 1973 and Can$41.067 in 1974, but since all gold produced was sold on the open market, these prices did not apply, and no assistance was required under the Emergency Gold Mining Assistance Act. The act was scheduled to expire on June 30, 1976.

Lode gold mines accounted for about 73% of Canadian production and base metal mines about 27%. Placer mining accounted for only 0.2% of the total, mainly from British Columbia and the Territories.

Leading lode gold mines in Canada that accounted for most of the gold production except that produced as a by-product from copper, lead, or zinc mines, with output in troy ounces are as follows:

| Location and mine | 1973 | 1974 |
|---|---|---|
| Ontario: | | |
| Campbell Red Lake Mines Ltd | 196,190 | 197,369 |
| Dome Mines Ltd | 148,512 | 121,032 |
| Kerr Addison Mines Ltd | 127,650 | 108,820 |
| Pamour Porcupine Mines Ltd.: | | |
| No. 1, 2, and 3 mines | 126,654 | 91,571 |
| Schumacher Div | 61,542 | 51,691 |
| Willroy Mines, Ltd. (Macassa Div.) | 50,529 | 43,611 |
| Dickenson Mines Ltd | 39,947 | 37,640 |
| Robin Red Lake Mines Ltd | 32,004 | 30,454 |
| Bulora Corp. Ltd. (Madsen) | 29,163 | 22,195 |
| Hollinger Mines Ltd. (Ross) | 19,264 | 23,000 |
| Quebec: | | |
| Camflo Mines Ltd | 98,228 | 81,700 |
| Sigma Mines Ltd | 78,203 | 73,000 |
| East Malartic Mines Ltd | 63,417 | 57,000 |
| Lamaque Mining Co. Ltd | 62,117 | 55,850 |
| Agnico-Eagle Mines Ltd.[1] | -- | 52,000 |
| Chibex Ltd.[2] | -- | NA |
| Marban Gold Mines Ltd.[3] | 18,510 | 9,377 |
| Northwest Territories: | | |
| Giant Yellowknife Mines Ltd | 102,321 | 71,105 |
| Supercrest mines Ltd. (Giant Y. mill) | 32,503 | 24,042 |
| Lolor Mines Ltd. (Giant Y. mill) | 23,469 | 6,367 |
| Cominco Ltd. (Con & Rycon) | 91,400 | 87,000 |

NA Not available.
[1] Mill started December 1973.
[2] Mill started November 1974.
[3] Mill closed Sept. 30, 1974.

Exploration and development of mines in the Red Lake District of northwestern Ontario enlarged ore reserves at the Campbell Red Lake, Dickenson, Robin Red Lake, and Wilmar mines. As a result of a discovery at the Wilmar properties, a study was undertaken for reopening the Cochenour mill. Bulora Corp. Ltd. purchased the mine and mill of Madsen Red Lake Gold Mines Ltd. for $1.7 million.

In the Missanabie District of central Ontario, Nudulama Mines Ltd. controlled by The Coniagas Mines Ltd. planned to dewater its idle mines, and reported reserves of 525,000 tons containing 0.19 ounce of gold per ton. Rengold Mines Ltd. leased the former Renabie mines from Willroy Mines Ltd. and planned exploration and dewatering to be completed early in 1975.

Other development programs were planned at the Duport mine in the Kenora area for the Pursides Gold mines in the Wawa area and for Lakelyn Mines Ltd. at Lingman Lake in northwestern Ontario.

In the Malartic district of Quebec, Goldex Mines Ltd. completed developing the Dalton and Probe groups of claims with a 2,400-foot decline and planned to treat the ore at the Malartic Gold Fields mill. East Malartic Mines Ltd., an associate of Malartic Gold Fields (Quebec) Ltd., was deepening the Barnat shaft and increasing its mill capacity from 1,650 to 2,000 tons per day. Chibex Ltd. began operation of its new mill in the Chibougamau District in late 1974 aiming for a rate of 700 tons per day by January 1975.

In British Columbia, Northair Mines Ltd. developed the Warman and Manifold veins at Brandywine Falls and planned a milling operation of 300 tons per day to treat its ore reserve of 400,000 tons containing 1 ounce of gold per ton. Other exploration projects were undertaken by Carolin Mines Ltd. northeast of Hope and by Bralorne Resources Ltd., a former gold producer at Bralorne in the Bridge River area. In the Northwest Territories, Cominco Ltd. continued sinking a deep shaft to reach new ore reserves at the Con mine.

Although the rise in gold prices did not produce a surge of new gold prospecting, exploratory work was continued in many old gold districts seeking new reserves for future operations.

**Iron Ore, Pig Iron, Iron and Steel.**—Despite the economic downturn, the iron ore industry continued to produce at a high level in 1974, only 0.5% below the record output of 1973. Total shipments were 47.4 million tons of which 10.6 million went to Canadian consumers, 19.7 million to the United States, 11.8 million to Europe, 4.2 to Japan and 1.2 million to other destinations.

Quebec and the adjacent area of Labrador contained the mines accounting for the major share of Canadian iron ore production which amounted to 74%. Ontario's nine mines contributed 23% and British Columbia 3% of the total as indicated by the following tabulation:

| Location and mine | Material, percent iron | 1974 shipments (thousand wet metric tons) |
|---|---|---|
| Quebec and Labrador: | | |
| The Hilton Mines, Shawville | Pellets, 67. | 888 |
| Iron Ore Co. of Canada: | | |
| Schefferville (Quebec-Labrador) | Direct shipping, 54. | 6,548 |
| | Pellets, 64. | 7,560 |
| Carol Lake (Labrador) | Concentrate, 68. | 4,309 |
| | Pellets, 61. | 1,863 |
| Sept-Isles (from Schefferville) | Concentrate, 64. | 8,284 |
| Quebec Cartier Mining Co., Gagnon | Pellets, 64. | 5,738 |
| Wabush Mines, Pointe Noire (from Labrador) | Pig iron. | 552 |
| Quebec Iron & Titanium Corp., Sorel (from Lac Tio) | | |
| Ontario: | | |
| Adams Mine, Kirkland Lake | Pellets, 65. | 1,133 |
| Algoma Ore Div., Wawa | Siderite sinter, 48. | 2,078 |
| Caland Ore Co., Atikokan | Pellets, 64. | 996 |
| | Concentrate, 56. | 917 |
| Griffith Mine, Bruce Lake | Pellets, 67. | 1,577 |
| Marmoraton Mining Co., Marmoraton | Pellets, 65. | 559 |
| National Steel Corp., Capreol | Pellets, 68. | 669 |
| Sherman Mine, Temagami | Pellets, 65. | 1,028 |
| Steep Rock Iron Mines, Atikokan | Concentrate, 54. | 12 |
| International Nickel Co. of Canada, Copper Cliff | Pellets, 68. | 1,349 |
| | Pellets, 68. | 591 |
| British Columbia: | | |
| Texada Mines, Texada Island | Concentrate, 61. | 325 |
| Wesfrob Mines, Tasu Harbor | Pellet feed, 68. | 569 |
| | Sinter feed, 58. | 379 |

The grade of crude ore in Canadian iron mines ranges from 19% iron at the Adams mine to 55% iron at Caland.

The Iron Ore Co. of Canada (IOC), managed by Hanna Mining Company, did not realize the full benefit of expansion plans completed in 1973 because of a labor shortage and mechanical problems. Its productive capacity was to be 33 million tons per year by 1976. Quebec Cartier Mining Co., a subsidiary of United States Steel Corporation, started to prepare the Mt. Wright open pit mine for a yearly production of 40 million tons of crude ore or 16 million tons of concentrate. A rail connection to Mt. Wright was completed in 1974, and the crushing and concentrating facilities were expected to be completed in 1975.

The Algoma Ore Division of The Algoma Steel Corp. Ltd. continued development work at the MacLleod mine to permit continued underground mining from the deeper levels of the mine for another 25 years. Algoma started receiving pellets from the Tilden mine in Michigan in December 1974. The Steel Company of Canada Ltd. (Stelco) also shared in production from the Tilden mine and announced that it would have a share of the production from two other U.S. projects, the Eveleth Taconite Project and the Hibbing Taconite Project, both in Minnesota. Dominion Foundries and Steel Ltd. (Dofasco) planned to continue drawing its ore supply from the Adams, Sherman, and Wabush mines in Ontario and Quebec.

Production of pig iron in 1974, 9.42 million tons, was 1% below 1973 production, but steel ingot production continued to grow, showing a 2% gain to reach a record 13.5 million tons. Exports of pig iron decreased in 1974 to about 520,000 tons. The major part of production was used to make steel (8.0 million tons) and a small part sold to foundries (0.9 million tons). Total crude steel production, including ingots, semimanufactures, and castings continued to grow but at a lesser rate than in 1973. Production in 1974, 13.5 million tons, was held back by shortages of raw materials and other constraining factors. Crude steel capacity was estimated to be 14.6 million tons in 1974, with some 2.0 million tons of capacity coming onstream during the year and 0.4 million tons of older open hearth capacity phased out. Domestic consumption, with strong demand, was supplied by a small excess of imports over exports in addition to domestic mill shipments.

Stelco was the leading Canadian producer with an output of 5.5 million tons of raw steel. Construction began on the new Lake Erie project near Nanticoke, Ontario. which was designed for an initial steelmaking capacity of 1.3 million tons per year and was scheduled to begin late in 1977. A 10-meter-hearth-diameter blast furnace will feed two 250-ton basic oxygen furnace vessels and an 80-inch hot-strip mill. The capital cost of the project was estimated at $430 million. Stelco also put a new electric furnace in operation at Contrecoeur, Quebec, and replaced electric furnaces at Edmonton, Alberta.

The Algoma Steel Corp. produced 2.5 million tons of raw steel in 1974. Construction continued on a new 4,500-ton-per-day blast furnace, as part of a rebuilding program, and this will increase capacity from 2.5 million to 3.2 million tons per year. Capital expenditures for new facilities in 1974 were about $139 million.

Dofasco produced a record 2.8 million tons of ingots and castings and spent $85 million on new capital manufacturing facilities. Projects underway included rebuilding a blast furnace, installation of a 5-stand 72 inch cold mill, and engineering for a new basic oxygen steel plant in Hamilton, Ontario.

Sydney Steel Corp. Ltd., Sydney, Nova Scotia, the only other integrated steelmaker had a capacity of 1 million tons per year. The installation of a continuous slab-caster was completed during 1974 as part of a modernization program begun in 1971. Of nine other steel plants mostly based on scrap, at least eight had expansion or modernization programs under construction in 1974. Total raw steel production was expected to expand by 6% in 1975.

**Lead.**—Canada did not use its full capacity for mine production of lead in 1974 and ranked only fourth in world production after the United States, the U.S.S.R., and Australia. Lead mine production in ores and concentrates dropped to 331,100 tons in 1974 from 387,800 tons in 1973. Output of primary refined metal decreased from 186,900 tons in 1973 to 125,200 tons in 1974. A strike at Cominco's Trail plant in British Colum-

bia from July 1 to October 31 cut refined metal production, and strikes or lockouts at the Cyprus Anvil, Brunswick, and Cominco mines limited mine production.

Yukon Territory was the leading producer among Provinces and Territories, providing 32% of the total. Other contributing areas were the Northwest Territories, 27%; British Columbia, 18%; New Brunswick, 15%; Newfoundland, 4%; Ontario, 3%; and three other Provinces, 1%.

The lead refining plant, at Trail, British Columbia, operated by Cominco produced 86,200 tons of lead, and the smelter at Belledune, New Brunswick, operated by Brunswick Mining and Smelting Corp. (64% owned by Noranda) produced 40,100 tons. Consumption of primary metal within Canada was estimated to be 75,000 tons in 1974.

Exports of refined metal decreased 37% to 71,700 tons, reflecting the loss of production by Cominco. Major markets were the United Kingdom and the United States. Exports of ores and concentrates maintained a level slightly above that of 1973, sending 194,100 tons of lead content abroad—58% to Japan, 13% to the United States, 10% to West Germany, and the balance to other European countries and Brazil. Imports of refined lead totaled 11,400 tons, which was larger than in previous years. Early in 1974 the U.S. International Trade Commission ruled against Canadian lead exporters in a dumping suit brought by The Bunker Hill Company against Canadian and Australian producers. The decision was appealed but a new hearing was not scheduled in 1974.

The two largest lead-producing mines in Canada, each with a production close to 90,000 tons of lead contained in concentrates, were the Pine Point mines of Cominco in the Northwest Territories and the Cyprus Anvil open pit operation at Faro in Yukon Territory. Other major lead producers were the Sullivan mine (Cominco) at Trail, British Columbia, with 1974 production estimated at 55,000 tons and the No. 12 and No. 6 mines of Brunswick Mining and Smelting Corp., New Brunswick, producing about 37,500 tons. Many of the large zinc mines in Ontario, Quebec, and Newfoundland produced lead concentrates as a substantial coproduct.

Feasibility studies were completed at the Polaris mine of Cominco on Little Cornwallis Island in the Northwest Territories and discussions were started with the Canadian Government concerning further development of the project. Ore reserves of 20 million tons were estimated to average more than 3% lead and 16% zinc. Exploration in the Yukon Territory continued with activity in the Vangorda Creek, Bonnet Plume, and Anvil Range areas.

**Molybdenum.**—Shipments of sulfides, ferromolybdenum, and oxide in Canada in 1974 were estimated to be 29.6 million pounds, slightly less than the 30.4 million pounds produced in 1973. The value of molybdenum production was estimated at $58.5 million. Domestic consumption was about 4.4 million pounds with the balance exported. Molybdenum demand exceeded supply with continued use in high-strength steel, especially pipeline material that can be welded under arctic conditions.

Production came from two sources mined primarily for molybdenum and from four copper mine producing molybdenum concentrate as a byproduct. The Endako mine of Placer Development Ltd. produced about 12 million pounds of recoverable molybdenum in concentrate and the Boss Mountain mine of Noranda produced about 1.8 million pounds after reopening early in 1974.

The byproduct producers were Brenda Mines Ltd. (Noranda) open pit copper-molybdenum operation at Peachland, British Columbia, 7.6 million pounds; Lornex Mining Corp. Ltd. (Rio Algom) open pit copper operation in the Highland Valley, British Columbia, 4.0 million pounds; Gibraltar Mines Ltd. (Placer Development) two open pits in the Cariboo District, British Columbia, 0.8 million pounds; and Gaspé Copper Mines, Ltd. (Noranda), with two mines near Gaspé, Quebec, 0.4 million pounds.

**Nickel.**—Production of nickel in Canada, the world's leading producer, was 262,200 tons in 1974 representing a 5% increase over 1973 production. Shipments exceeded production as producers reduced inventories to minimum working levels.

Nickel prices were increased three times during 1974 from a January price of $1.53 per pound for refined nickel to $2.01 at yearend.

INCO accounted for over 80% of the total nickel production with metal

deliveries of 549 million pounds. The high level of sales was the result of strong demand met by record production. INCO operated 12 mines in the Sudbury Basin of Ontario, 1 at Shebandowan, Ontario, and 3 mines in the Thompson area in Manitoba. Two smelters at Thompson and Sudbury and a nickel refinery at Copper Cliff were supplemented by refineries and rolling mills in other countries.

Falconbridge Nickel Mines Ltd., the second largest Canadian producer, delivered over 89 million pounds of nickel, excluding ferronickel, from its integrated complex near Falconbridge in the Sudbury area of Ontario and operated several other mines near Sudbury and one at Manibridge, Manitoba. Construction for the environmental improvement program continued, including work on a new sulfuric acid plant.

Sherritt Gordon Mines was the third nickel producer in Canada with a production of 26 million pounds including purchased ores and toll refining. The Lynn Lake mine was operated at 30% below its rated capacity, producing 6 million pounds of nickel and 3.2 million pounds of copper in concentrates. Sherritt Gordon's Fort Saskatchewan refinery was shutdown for 6 weeks because of a shortage of feed material; concentrates and matte from Australia were used to supplement domestic concentrates.

The Giant Mascot Mines Ltd. concentrator near Hope, British Columbia, was closed August 30, 1974, when ore reserves at the Giant Nickel mine were exhausted. Exploration on the Giant Nickel property is continuing. The Langmuir property of the Noranda group in northern Ontario produced concentrate containing 1.5 million pounds of nickel from ore that averaged 1.5% nickel.

**Silver.**—Mine production of silver dropped from the record rate of 47.5 million troy ounces in 1973 to 43.8 million troy ounces in 1974 valued at over $200 million. Canada retained its position as the leading silver-producing nation in the world with the U.S.S.R., Peru, Mexico, and the United States following closely, in that order.

Silver was produced in eight Provinces and two Territories with output and percentage as follows:

| Province | Thousand troy ounces | Percent of total |
|---|---|---|
| Ontario | 17,674 | 40.4 |
| British Columbia | 6,235 | 14.2 |
| Yukon Territory | 6,158 | 14.1 |
| New Brunswick | 4,382 | 10.0 |
| Northwest Territories | 4,252 | 9.7 |
| Quebec | 2,860 | 6.5 |
| Manitoba | 1,303 | 3.0 |
| Newfoundland | 647 | 1.5 |
| Saskatchewan | 227 | .5 |
| Nova Scotia | 27 | .1 |
| Total | 43,765 | 100.0 |

The largest producing mine was Ecstall Mining Ltd. at the Kidd Creek mine near Timmins, Ontario, recovering silver as a coproduct of copper, lead, and zinc concentrates. Other large producers were Brunswick Mining and Smelting Corp., Bathurst, New Brunswick; Mattabi Mines Ltd., Sturgeon Lake, Ontario; Cominco's Sullivan mine, Kimberley, British Columbia; United Keno Hill Mines Ltd., Elsa, Yukon; Echo Bay Mines Ltd., Port Radium, Northwest Territories; and Cyprus Anvil Mining Corp., Faro, Yukon. Each produced over 2.0 million ounces of silver. The major part of Canada's silver production was from zinc-lead or copper-lead-zinc ores but a few mines such as Echo Bay and United Keno Hill were primarily silver producers. Substantial contributions were made by nickel mines in the Sudbury District and by silver-cobalt mines in the Cobalt District of Ontario.

Silver refineries are operated by Canadian Copper Refiners (Noranda), Montreal East, Quebec, to recover silver from treatment of anode and blister copper; by Cominco, Trail, British Columbia, treating lead and zinc concentrates; and by the Royal Canadian Mint, Ottawa, Ontario, recovering silver from gold bullion. Refined metal production in 1974 included 19.4 million ounces from Canadian Copper Refiners and 6.6 million ounces from Cominco.

Exports of silver in ores and concentrates in 1974 totaled 19.4 million ounces valued at $62 million, with 56% going to the United States and 28% to Japan. Refined metal exports were 21.3 million ounces valued at $99.5 million with 97% going to the United States. Imports of silver were 28.7 million ounces valued at $122.7 million, 80% from the United States. The minting of Canadian Olympic coins containing 92.5% silver was started

in 1974; the issue will commemorate the Olympic Games to be held in Montreal in 1976. It was estimated that nearly 65 million ounces would be consumed to produce coins with a face value of $450 million. Estimated consumption of silver in Canada for all uses including coinage was 16,870,000 ounces in 1973 and 8,420,000 ounces in 1972.

**Uranium.**—Although renewed interest in uranium and increases in price stimulated exploration and plans for expansion, production in 1974, at 4,265 tons of $U_3O_8$, continued at about the same rate as in 1973.

The operating mines were the same as in 1973, Denison Mines Ltd. and Rio Algom Mines Ltd., both at Elliot Lake, Ontario and Eldorado Nuclear Ltd. at Uranium City, Saskatchewan. Denison started to expand its mill capacity from 4,000 to 6,400 tons of ore per day with completion expected in 1975. Rio Algom operated the Quirke mill at 4,000 tons per day and scheduled its expansion to 6,350 tons per day as well as planning to reopen the nearby Nordic mill with an eventual capacity of another 6,350 tons per day. Eldorado Nuclear operated at about one-half of capacity in 1974 but planned new mine development.

Gulf Minerals Canada Ltd. was preparing its open pit mine at Rabbit Lake, Saskatchewan, for operation in 1975. Agnew Lake Mines (Kerr Addison), Agnew Lake, Ontario, planned a pilot plant leaching operation for broken underground ore. Amok Ltd. announced its intention to develop its Cluff Lake, Saskatchewan, property to produce 1,800 tons per year of $U_3O_8$ by 1978.

Total production planned for 1975 was reported as 5,500 tons of $U_3O_8$ and by 1980 capacity was expected to reach 10,900 tons per year.

Canadian producers negotiated several export contracts during 1974 and in order to protect Canada's commitment to domestic nuclear power, the Canadian Government, late in 1974, announced safeguards to provide sufficient uranium for domestic use. Each producer was to be allocated a domestic reserve margin based on the ratio of its reserves to total Canadian reserves. Other restrictions on sales abroad were designed to protect Canadian technology and prevent use of material for nuclear explosives. Producers were thought to have almost 50% of their adjusted resources available for export or for expanded domestic needs after satisfying present commitments and legislated safeguard restrictions.[4]

**Zinc.**—Canada, the world's leading zinc producing country, mined 1.2 million tons of zinc in 1974, a 5% decrease from the record 1973 output. The value of zinc production, however, rose from $653 million in 1973 to $900 million in 1974; strong demand in the first half of 1974 maintained the favorable prices in effect at yearend 1973. Demand was sluggish in the fourth quarter and the LME price and parity differential dropped below the established producer prices.

Seven operating mines in Ontario produced about 422,000 tons of zinc in concentrates with the Ecstall Mine of Texasgulf mining the major portion. In the Northwest Territories, Pine Point Mines Ltd., continued its normal production of about 177,000 tons to give the Territories second rank among the Provinces and Territories. New Brunswick had three producing units with a total output of 159,000 tons. The Nigadoo River Mines Ltd. (Sullivan Group) resumed work late in the year after being shutdown since January 1972. Brunswick Mining and Smelting, despite interruptions due to labor problems, produced 121,000 tons of zinc in concentrate and Heath Steele Mines, produced 66,400 tons of concentrate containing an estimated 34,000 tons of zinc. Quebec reported seven zinc-producing mines for a total production of 125,000 tons. In the Yukon Territory, Cyprus Anvil Mining was the principal zinc producer with sales of 79,000 tons. Total production of Yukon Territory was 89,000 tons. British Columbia zinc production suffered from the strike at Cominco's Sullivan and H.B. mines. The output of the province dropped 39% to 83,000 tons. In Manitoba, Hudson Bay Mining & Smelting was the major producer refining 70,750 tons of zinc from its own 10 mines and from custom ores. Sherritt Gordon Mines, operated two mines, the Fox Lake and Ruttan, producing zinc concentrate for the Hudson Bay smelter and for export. The total output of the province was estimated to be 78,800 tons. Saskatchewan contains

[4] Department of Energy Mines and Resources, Canada. 1974 Assessment of Canada's Uranium Supply and Demand. August 1975, pp. 3–9.

part of the Hudson Bay properties and was credited with a production of 6,300 tons. In Newfoundland, the principal producer, the Buchans mine managed by ASARCO, produced an estimated 19,000 tons of zinc in concentrates, all for export.

One of the major new developments in Canada was the formation of Nanisivik Mines, to develop and mine a lead-zinc deposit on the northern end of Baffin Island in the Northwest Territories. Ownership is divided among Mineral Resources International Ltd. (in which Texasgulf has an interest), 59.5%; the Government of Canada, 18%; Metallgesellschaft A.G., 11.25%; and Billiton International Metals N.V., 11.25%. Ore reserves are estimated to be 6.9 million tons of ore containing 14% zinc, 2% lead, and 2 ounces per ton of silver.

Cominco participated in two possible new developments in the Northwest Territories. One was on the Bathurst Norsemines property near Bathurst Inlet where diamond drilling added substantially to the ore reserves, and the second was at the Polaris mine of Arvik Mines Ltd., on Little Cornwallis Island, where a feasibility study demonstrated that production would be economic under certain conditions.

Newfoundland Zinc Mines Ltd. (Teck Corporation 63%, Amax Inc. 37%) was planning to commence operations at the Daniels Harbor mine late in 1975 from ore reserves indicated to be 4.5 million tons averaging 8.8% zinc.

Exports of zinc in concentrates during 1974 increased by 4% over those of 1973 to 868,900 tons of zinc content. Exports of zinc metal as blocks, pigs, or slabs in 1974 were 295,400 tons, a 30% decrease from shipments in 1973, with 61% of the total destined for the United States.

Imports of zinc metal, unwrought, dropped from 18,500 tons in 1973 to 7,020 tons in 1974. Canadian consumption of slab zinc in 1974 was 169,000 tons, continuing the growth trend at a rate of 10% per year.

Canadian smelter production suffered a setback in 1974 caused by strikes at Cominco and at Canadian Electrolytic Zinc Ltd. (CEZ) a Noranda associate. The following table compares capacity with production:

| Company and location | Annual capacity (metric tons) | 1974 Production (metric tons) |
|---|---|---|
| Cominco Ltd., Trail, British Columbia | [1] 245,000 | 147,000 |
| Canadian Electrolytic Zinc Ltd., Valleyfield, Quebec | [2] 127,000 | 122,300 |
| Hudson Bay Mining & Smelting Co. Ltd., Flin Flon, Manitoba | 72,000 | 78,800 |
| Texasgulf Inc., Timmins, Ontario | [3] 109,000 | 97,900 |
| Total | 553,000 | 438,000 |

[1] Expansion to 272,000 tons by 1977.
[2] Expansion to 205,000 tons by 1975.
[3] Expansion to 136,000 tons by 1975.

## NONMETALS

**Asbestos.**—Canadian production of asbestos decreased 2.1% to a level of 1.7 million tons during 1974. Domestic values rose by about $77 million to $313.7 million an increase of almost 33% from the 1973 total. The strong increase in value despite a slightly declining production rate was attributed to firm market demand and a very tight supply situation. Asbestos was produced in four Provinces and the Yukon Territory. In Quebec, nine mines provided 85% of Canadian production. British Columbia and the Yukon each contributed 5% to the total with one mine operating in each region. The balance came from one mine in Newfoundland with 5% of the total and a single operation in Ontario. Canada remained the largest world producer of asbestos, providing 37% of the total world supply.

Exports of crude asbestos and milled fiber during 1974 totaled 1.6 million tons which was close to 94% of the total 1974 production. The value of export sales was about $339 million, reflecting very strong demand in world markets. Asbestos raw material was shipped to more than 70 countries throughout the world. Eleven countries accounted for 80% of the total shipments. The primary customers were the United States, 40%; West Germany and Japan, with 8% each; and the United Kingdom, 6%. Other customers in declining order of importance were

France, Spain, Belgium-Luxembourg, Australia, Brazil, Mexico, and Italy.

United Asbestos Inc. continued with development of its property near Matachewan, Ontario, to be in production by July 1975. Initial output was scheduled to be 35,000 tons per year, rising to full capacity of 100,000 tons per year by 1976. A serious setback to the industry was suffered when the Thetford, Quebec, mill of Asbestos Corp. Ltd. was destroyed by fire in December 1974. The low inventories of number 4, 5 and 6 fibers were aggravated by the resulting loss in production. Abitibi Asbestos Mining Co., Ltd., continued development of its prospect at Amos, Quebec. Proven ore reserves were estimated to be approximately 100 million tons assaying 4% fiber content. Product from this property could reach the market by 1978. Rio Algom Mines Ltd. stepped up evaluation and testing of a deposit on the property of the McAdam Mining Corp. Ltd. about 20 miles east of Chibougamau, Quebec. Estimated reserves exceed 186 million tons with a fiber content of over 3.5% asbestos.

**Potash.**—Production of potash in Canada during 1974 reached a record high of 5.5 million tons, an increase of 1.2 million tons or 24% when compared with 1973 production. The value of production in 1974 was approximately $306 million, an increase of $127 million, 72% over the 1973 total. All of the potash produced in Canada was mined and processed in the province of Saskatchewan.

The continuing requirement for additional food supplies throughout the world has increased demand for potash as a fertilizer with the result that the Canadian potash industry was operating at capacity wherever possible. The single curtailment of production in 1974 occurred in January when a serious plant fire forced Cominco to cease production for a period of 3 months. Inventories have declined from a 1974 high of 531,000 tons in January to a low of 106,000 tons in November. The latter figure represented only a 5-day production. Prices rose from a low of $11 per ton in 1969 to over $70 per ton in 1974. During 1974 the potash regulations (Saskatchewan, 1969) were raised five times to permit production at full capacity. On October 23 the Provincial authorities announced a new formula for calculation of tax on potash revenues. It was estimated that at a price of $60 per ton of $K_2O$ the new tax would yield the Provincial Government approximately $10 per ton of $K_2O$ equivalent. It was also announced that the Saskatchewan Government will assume full or majority ownership of all new potash mines in the Province.

Canada exported 95% of its potash production during 1974. The bulk went to the United States. Other customers included Japan, Belgium-Luxembourg, Brazil, India, South Korea, and the People's Republic of China.

The Potash Company of America (PCA) continued development drilling in New Brunswick following terms of an agreement signed in 1973 with the provincial government. Work on the property near Sussex, indicated continuation of a potash deposit according to PCA.

**Sulfur.**—Production of sulfur in Canada during 1974 totaled 8.0 million tons, virtually the same as 1973. Recovery of sulfur in the form of acid from smelter gases and pyrite remained fairly stable at about 760,000 tons. The balance of production was in the form of elemental sulfur generated in the refining of sour gas, petroleum, and other sources.

After a steady decline of prices from a high of $37 per ton in 1968 to a low of $5 per ton, f.o.b. Alberta plant, in 1973, tight supplies reversed the trend and prices rose to $30 per ton during 1974. Delays in bringing new worldwide capacity onstream, and problems with Canadian shipping were the immediate cause of short supplies.

Canada retained its position as the world's largest supplier of sulfur to international markets. During 1974 export sales increased 17% over those of 1973 to a record total in excess of 4.5 million tons. The United States imported over 1.2 million tons of Canadian sulfur during 1974, establishing a new record high. Offshore shipments also increased by 10% following a decline in 1973. During 1974 sulfur was exported to 29 countries of which 8 were responsible for 60% of the total. The United States was first, accounting for 27%, followed by Australia and Japan with 10% each. Italy received 8%, slightly more than the Republic of South Africa and New Zealand both of which accounted for 6%.

Elemental sulfur was produced at 45

plants with a combined yearly capacity of 9 million tons. One plant was located in Saskatchewan, 2 in British Columbia, and the remaining 42 in Alberta.

## MINERAL FUELS

**Coal.**—Canada's production of all types of coal during 1974, including bituminous, subbituminous, and lignite registered an increase for the fourth consecutive year. More than 21.0 million tons of clean coal were produced compared with approximately 20.5 million tons produced during 1973. This continued growth reflects a strong demand for coking coal from the western producing regions as well as utilization of steam coals from the prairie Provinces. The value of the 1974 production was approximately $270 million as compared with about $177 million in 1973. This increase of $93 million or 52% of the 1973 total can be attributed to some degree to increased production; however, prevailing high prices were the strong factor in overall gain. The bulk of metallurgical coal is exported to Japan. During 1974 exports totaled 11.9 million tons, a small increase from 1973 when 10.9 million tons were exported. Japan was the largest customer, receiving about 11 million tons or 92% of the total, followed by the United States, West Germany, and Denmark.

Canadian imports of coal during 1974 were virtually all from the United States. The total landed tonnage was over 12.3 million tons of which approximately 348,000 tons was anthracite and the balance bituminous. The bulk of the bituminous coal, 11.5 million tons, was consumed in Ontario. Most of this coal was metallurgical rank and was used to manufacture coke for consumption by the steel industry. A minor but significant portion of the coal was utilized in Ontario and Quebec for the production of electricity. The province of Quebec was the main consumer of anthracite coal, accounting for 278,000 tons or some 80% of the total. The principal use of anthracite coal in Canada is for specialized industrial applications.

Five Provinces produced coal during 1974. The largest tonnage was mined in Alberta with 8.9 million tons amounting to approximately 42% of the total Canadian output. Subbituminous coal accounted for 5.7 million tons, 64% of Provincial production, and was used exclusively for power generation. The remaining tonnage was composite medium and low-volatile bituminous coal which was shipped to Japan.

The second largest coal producing Province was British Columbia with 7.5 million tons, 36% of the national total. This coal was all low-volatile bituminous and was shipped to Japan. Saskatchewan was third, mining 3.4 million tons of lignite. All of this low-grade coal was used for power generation, principally in Saskatchewan with some tonnage shipped to Manitoba for its two powerstations. Fourth in the order of coal producing Provinces was Nova Scotia with 1.3 million tons or 6% of the national total. Nova Scotian coal falls in the rank of high-volatile bituminous and is used for both coking and thermal applications.

Continued expansion of the Canadian coal industry was the keynote through 1974 as production, exploration, and marketing efforts were increased. The major effort was in the western producing Provinces. The prairie Provinces were also active as they prepared to meet the needs of expanding energy requirements. Development of reserves in mainland Nova Scotia and Cape Breton Island was programed to increase future output.

The principal operating companies were in British Columbia; these were Kaiser Resources Ltd., with two producing mines in the Crows Nest Field and Fording Coal Ltd. with a surface operation in the Upper Elk Field. Kaiser Resources, which is 30.2% owned by Mitsubishi Corporation, operated a complex open pit and underground mining system which produced in excess of 4.4 million tons of clean coal during 1974. Most of the tonnage was shipped to Japan. In addition, during 1974 Kaiser Resources also shipped 28,000 tons to the Stelco, and 20,000 tons to Dofasco, both in Hamilton, Ontario, for evaluation as a domestic source of coking coal. The company has commenced a $3.5 million expansion program to develop a reserve of 1.5 million tons at its open pit mining operation.

Fording Coal, owned 60% by Canadian Pacific Investments and 40% by Cominco, shipped about 1.7 million tons during 1974 as compared with 2.0 million tons in 1973. The drop in production was the result of a 7-week strike by the mine workers. Virtually all of the coal was

consigned to Japanese steel makers. A trial shipment of 10,000 tons was shipped to The Algoma Steel Corp., Ltd.

Exploration for coal in British Columbia continued through 1974. Rio Tinto Canadian Exploration Ltd. (Riocanex), a subsidiary of Rio Algom Mines Ltd., continued work near the Montana border in the Flathead region. Other companies active in the area included Crows Nest Industries Ltd., Scurry-Rainbow Oil Ltd., and its partner Emkay Canada Natural Resources Ltd.

Coking coal is produced in Alberta by McIntyre Mines Ltd., Cardinal River Coals Ltd., Coleman Collieries, and the Canmore Mines Ltd. During 1974, McIntyre Mines produced approximately 1.4 million tons of clean coal from one underground and two open pit mines on the Smoky River property near Grande Cache, Alberta. The largest part of this production was shipped to Japan. Cardinal River Coals Ltd., owned jointly by Consolidation Coal Company of Canada and Luscar Ltd., produced 744,000 tons of coking coal at the Luscar colliery. All of this production was shipped to Japan. Expansion of production to 2.5 million tons per year beginning in 1975 has been announced. Coleman Collieries Ltd. operated two underground and one surface mine during 1974 producing a total of 794,000 tons of clean coal. About 90% of this output was exported to Japan. Preproduction stripping was carried out on the Tent Mountain property and initial mining operations are scheduled to commence during 1975. Canmore Mines Ltd. continued production during 1974 with a total of about 170,000 tons of which some 80% was shipped to Japan.

In the plains region of Alberta, mining of subbituminous coal was expanded to meet electrical demand. Manalta Coal Ltd. produced a total of 4.4 million tons of coal to supply the Calgary, Sundance, and Battle River powerstations during 1974. Forestburg Collieries Ltd. also produced about 544,000 tons of thermal coal which was utilized at the Battle River powerplant. Exploration continued in Alberta during 1974. McIntyre Mines Ltd. entered into an agreement with Meadowlark Farms, Inc., a subsidiary of Amax Coal Co., New York, for evaluation and development of the Copton property. Consolidation Coal Company of Canada completed studies on its Brazeau project near Nordegg. Consolidation Coal also announced production plans for 1.4 million tons of clean coking coal over a 15 year period at the Nordegg mine pending an operating permit from the Government of Alberta. During 1974, four mines in the Estevan-Bienfoit region produced about 3.4 million tons of lignite for thermal power generation. The Manitoba and Saskatchewan Coal Co. Ltd. contributed about 2 million tons from the Boundary Dam and M & S mines. The balance was mined by Manalta Coal Ltd. from its Utility Coals Ltd. mine and the Klimax operation.

In the east a total of 2 million tons was produced in the provinces of Nova Scotia and New Brunswick. In Nova Scotia the Cape Breton Development Corp. (DEVCO) of Sydney produced 1.6 million tons of coal at the Lingan and No. 26 mines. Expansion programs continued at both mines. It was anticipated that 1975 production will reach a level of 2.5 million to 3 million tons as a result of mine improvements. During 1974 DEVCO began construction of a new preparation plant at Grand Lake. This plant was designed specifically for production of low-sulfur coal and was scheduled to come on-stream in 1976.

Coal was mined in New Brunswick in the Minta-Chipman area by N.B. Coal Ltd. In 1974 six surface mines produced about 354,000 tons.

**Petroleum and Natural Gas.**—Production of crude oil in Canada during 1974 declined for the first time since 1958. The drop in production was attributed to newly established government regulations which reduced shipments of oil and gas to the United States. The value of crude oil, natural gas, and natural gas liquids, however, reached an alltime high of $4.9 billion, 60% higher than the record established in 1973. This sharp increase in revenue was the result of a rise in prices.

Average production of crude oil including synthetic oil and natural gas liquids totaled 1.9 million barrels per day during 1974, a drop of 5.5% from the record production level of 1973. Of the total annual crude oil and equivalent production, 99% was provided by the provinces of Alberta, Saskatchewan, and British Columbia.

Total demand for crude oil by Canadian refiners decreased slightly to 1.7 million barrels per day of which 900,000 barrels was supplied by Canadian sources. This represents an increase in demand for domestic crude oil of 9% over the 1973 requirements and was accounted for by shipments of approximately 86,000 barrels per day to refineries in Quebec and the Maritime Provinces. This unprecedented eastward movement was precipitated by a partial embargo on exports of crude oil to Canada, levied by Arab producing States. Use of imported oil by Canadian refiners during 1974 dropped to 760,000 barrels per day, a decrease of 11% from 1973.

The decline in use of imported crude oil was supplemented by increased shipment of domestic production made possible by curtailment of Canadian exports to the United States. Shipments to the United States were reduced by 220,000 barrels per day, a drop of 19% from the 1973 average. The refiners east of the Rocky Mountains received about 735,000 barrels per day, a loss of 159,000 barrels per day as compared with 1973 shipments. West of the Rockies refiners received 195,000 barrels per day, a decline of 62,000 barrels per day when compared with 1973 figures.

In summary, Canada remained a net exporter of crude oil and products in 1974, although at a somewhat reduced level from that of 1973. Annual exports exceeded imports by 105 million barrels or 287,000 barrels per day. By the end of 1974, Canada's crude oil refining capacity was in excess of 2 million barrels per day, an increase of about 167,000 barrels per day. This increase was due entirely to expansion of existing facilities as no new plants were constructed during the year. The petroleum refining industry totaled 40 refineries in 9 Provinces and 1 small operation in the Northwest Territories. Quebec was the largest producer with 32% of the total. Ontario was second with 26%, followed by Alberta and Nova Scotia each with 9%, British Columbia with 7%, New Brunswick 6%, and Newfoundland 6%. The balance came from Saskatchewan and Manitoba along with a nominal amount from the Northwest Territories.

Production of natural gas in Canada during 1974 declined to 8.4 billion cubic feet per day as compared with 8.5 billion cubic feet per day in 1973. Value of production was $692 million as compared with $455 million in 1973. This substantial increase in return was attributed to a near doubling of wellhead prices during the year. During 1974 export sales of natural gas to the United States declined to 2.48 billion cubic feet per day, a reduction of 343 million cubic feet per day from the 1973 level. The total amount exported was the maximum allowed by the National Energy Board less some cutbacks in deliveries by West Coast Transmission Company Ltd. due to production problems in several of the western fields. By yearend 1974 there were close to 19,000 proven wells with an estimated reserve total of 80 trillion cubic feet of marketable gas, located in 6 Provinces and the Northwest Territories.

Alberta Province was the largest producer, accounting for about 90% of the total. There were 209 gas processing plants in operation during 1974 of which 188 were located in Alberta. Saskatchewan had 9 plants, British Columbia 6, Ontario 5, and the Northwest Territories 1 plant. Natural gas pipelines totaled over 71,600 miles in 1974. This pipeline network provided linkage for gathering, transmission, and distribution to and from 10 Provinces and the Northwest Territories. The pipelines also service delivery at nine connecting points along the United States border, which serve as export terminals.

Exploratory and development drilling in Canada declined during 1974. Most of the drilling was conducted in the Western Provinces, particularly Alberta. No significant discoveries of oil or gas were realized. Exploration continued in the northern regions, both on the mainland and at offshore drilling stations. A new technique in the construction of manmade islands, composed either of gravel or ice, has extended the search seaward with considerable success. Drilling of the Mackenzie Delta continued through 1974. Since the inception of this program in 1965, three major gasfields and one oilfield have been discovered. One of these, the Taglu Field on Richards Island was initially discovered in 1971, with subsequent stepout drilling proving in over 3 trillion cubic feet of gas. Other important gas discoveries have been made at Mallik, Ya Ya, Reindeer, Titalik, Niglintgak, and Adgo with oil discoveries

reported at Ivik, Kugpik, and Kumac.

Potential gas reserves in the Canadian Arctic are estimated to be in excess of 300 trillion cubic feet. The cost of exploration, development, and transportation is very high; however, it is expected that increase in wellhead prices will prove an incentive for pipeline construction to eastern Canada and the United States market by 1980.

Exploratory offshore drilling on the Canadian east coast continued through 1974. Although the drilling results on the Scotian Shelf and Grand Banks were disappointing, industry interest was revived by significant discoveries on the Labrador Shelf by Gulf Oil Canada Ltd., about 200 miles north of St. Johns, Newfoundland. Two wells, the Bjarni H–81 and the Gudrid H–55 had test flow rates of 13 million and 20 million cubic feet daily, respectively. These wells were the first completed on a 30-million-acre block which will be further tested during 1975.

In addition to the traditional sources of mineral fuels, Canada also possesses a supplemental source in the form of the Athabasca tar sands. The first company to invest in this potential energy source was Great Canadian Oil Sands Ltd. (GCOS), controlled by Sun Oil Company. Commercial operations began in 1968 and the company operated at a loss until 1974 when a profit of $4 million was recorded. Output of synthetic crude oil during 1974 was at the rate of some 46,000 barrels per day, a drop of about 9% compared with that of 1973. The loss in production was attributed to mechanical difficulties, and future recovery is expected to reach official capacity of 65,000 barrels per day.

In addition to GCOS, three additional companies have been formed to further develop the potential of oil sands.

Syncrude Canada, Ltd., controlled by Imperial Oil Ltd., 30%; Atlantic Richfield Canada Ltd., 30%; Canada-Cities Service Ltd., 30%; and Gulf Oil Canada Ltd., 10%, has received approval to construct a plant which will yield 125,000 barrels per day. Estimated cost is $1 billion and production was scheduled to commence in 1977. Shell Canada Ltd., and Shell Explorer Ltd., controlled by Royal Dutch/Shell Group of Companies proposed a plant to produce 100,000 barrels per day commencing in 1980, reaching full-scale operation by 1982. The estimated cost of the project in terms of 1974 dollars was placed at $680 million. Petrofina Canada Ltd., controlled by Petrofina, S.A., Brussels, Belgium, also approached the Government of Alberta, seeking permission to build a plant to produce 122,000 barrels of synthetic oil per day and to be operational by 1982. Cost of the project is estimated to be $1.4 billion.

# The Mineral Industry of Chile

By George J. Coakley [1]

Chile ranked as the world's second largest producer of copper and iodine, third in molybdenum, and eighth in silver in 1974. Mineral industry exports, including iron ore and nitrates, accounted for 84% of all exports in 1974. Copper exports alone accounted for approximately 75% of the country's foreign exchange earnings. With identified copper reserves estimated at nearly 9 billion tons of ore containing up to 100 million tons of copper, the Chilean copper industry will continue to play an important role in the domestic and world economies for years to come. Production of nearly all mineral commodities increased during the year, while the output of some mineral fuels continued to decline. Chile showed an overall favorable mineral trade balance despite a drop in copper prices in the second half of 1974 and the purchase of over $300 million in crude petroleum imports.

In actions attempting to bolster the depressed world copper market, Chile as a member of the Conseil Intergouvernemental Des Pays Exportateurs De Cuivre (CIPEC) agreed to cut all copper exports by 10% effective December 1, 1974. To help this cutback Corporación del Cobre de Chile (CODELCO) announced a 6-month suspension of mining operations at Exótica at yearend.

In a major step towards encouraging a renewed foreign investment climate, the new Chilean Government proclaimed Foreign Investment Law (Decree Law 600) on July 11, 1974. The new law allows for negotiated contracts and guarantees foreign investors the right to repatriate the return of capital invested and profits obtained and that taxes as stated in the contracts will not be modified. In a second step to improve the investment climate, Chile settled all outstanding litigation and agreed to pay $384 million in compensation to the three major foreign copper companies whose mines were expropriated by the Chilean Government in 1971.

**Government Policies and Programs.**—In an effort to promote renewed foreign capital investment in Chile and to stimulate the growth of industries vital to economic and social development, the Government promulgated a new Foreign Investment Law, Decree Law 600, on July 11, 1974. This law permits foreign investment in new or existing companies with acquisition or investment in certain state-owned companies allowed until December 31, 1975. It guarantees the availability of foreign exchange, the right to remit an agreed-upon percentage of capital and profits, and the right to compensation in cases where the status of the foreign investor is changed by legislation or any other discriminatory circumstance. The Foreign Investment Committee established by the law is empowered to negotiate freely with each foreign investor, to reduce taxation if the rates affecting the foreign investor in Chile are higher than those internationally acceptable, and to authorize the import of capital goods partly or totally free of duties. Duration of normal contracts specified as up to 10 years, with special contracts of 20 or more years subject to the approval of the Committee. Taxes on natural resource investments as specified in a contract will not be modified during the life of the contract.[2]

CIPEC, comprised of Chile, Peru, Zaire and Zambia, was established in 1967 to

[1] Physical scientist, Division of Nonferrous Metals.

[2] Price Waterhouse & Co. Doing Business in Chile, Information Guide. January 1975, 68 pp.

coordinate the unified promotion of profitable copper production and marketing practices and policies. In 1974 the CIPEC countries accounted for approximately 31% of world mine production and 52% of world trade in refined copper of which Chile contributed 12% and 17%, respectively. Key actions made by CIPEC in 1974 to counteract the sharp fall in copper prices included discussions with the U.S. Government on the orderly disposal of the U.S. copper stockpile and negotiations with Japanese Government and copper industry officials which led to the suspension of reexports of excess Japanese copper back to the world market. In November the CIPEC ministers met in Paris and agreed, effective December 1, 1974, to cut back all copper exports by 10% in comparison with the levels achieved during the previous 6 months. This quota represented a total reduction in CIPEC country shipments of 17,500 tons of copper per month,[3] of which Chile's share should be 7,500 tons per month.

## PRODUCTION

Increased labor productivity and the stimulus provided by a realistic foreign exchange policy led to a marked increase in 1974 production in nearly all major mineral commodities except for the mineral fuels. In 1974 Chile ranked second in world production of copper, third in molybdenum and eighth in silver. Smelter and refinery outputs of copper increased 23% and 30% respectively. Total mine production of copper and iron ore increased 23% and 9%, respectively. Improved operation of Chile's three molybdenum plants yielded a 1974 output double that of 1973. Net crude fertilizer materials increased 7% as production of sodium nitrate and phosphatic guano increased 22% and 43%, respectively, while potassium nitrate decreased 51%. Iodine production rose slightly by 3%. Affected by diminishing economic reserves of petroleum and a shortage of production facilities, 1974 mineral fuels production levels decreased 5% in natural gas and 12% in petroleum. Coal production increased 7%.

[3] Conseil Intergouvernemental des Pays Exportateurs de Cuivre. Copper in 1974 (CIPEC Annual Report). Paris, June 1975, 103 pp.

Table 1.—Chile: Production of mineral commodities
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| **METALS** | | | | |
| Copper: | | | | |
| Mine output, metal content [2] | | 716,800 | 735,400 | 902,100 |
| Metal, copper content: | | | | |
| Smelter [3] | | 630,600 | 589,900 | 724,400 |
| Refined: [4] | | | | |
| Fire | | 97,800 | 78,200 | 112,200 |
| Electrolytic | | 363,600 | 336,600 | 425,900 |
| Gold, mine output, metal content | troy ounces | 94,571 | 97,995 | 118,829 |
| Iron and steel: | | | | |
| Ore and concentrate | thousand tons | 8,640 | 9,402 | 10,292 |
| Pig iron | do | [r] 487 | 458 | 532 |
| Ferroalloys | do | 14 | [e] 14 | [e] 14 |
| Crude steel [5] | do | [r] 622 | 541 | 635 |
| Semimanufactures (hot rolled) | do | 491 | 435 | 543 |
| Lead, mine output, metal content | | [r] 462 | 256 | 420 |
| Manganese ore and concentrate | | 16,085 | 14,434 | 28,695 |
| Mercury | 76-pound flasks | 640 | 798 | 921 |
| Molybdenum, mine output, metal content | | 5,885 | 4,843 | 9,757 |
| Silver | thousand troy ounces | 4,689 | 5,035 | 6,646 |
| Vanadium, mine output, metal content [e] | | 650 | [r] 960 | 290 |
| Zinc, mine output, metal content | | 1,162 | 1,602 | 3,349 |
| **NONMETALS** | | | | |
| Barite | | 5,902 | 4,696 | 4,194 |
| Borates, crude, natural | | 2,250 | 1,532 | 968 |
| Cement, hydraulic | thousand tons | [r] 1,383 | 1,378 | 1,425 |
| Clays: | | | | |
| Kaolin | | 67,056 | 44,753 | 74,974 |
| Other (unspecified) | | 95,294 | 123,209 | 152,632 |
| Diatomite | | 4,863 | 886 | 2,290 |
| Feldspar | | 2,196 | 530 | 2,806 |

See footnotes at end of table.

## Table 1.—Chile: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Fertilizer materials, crude: | | | | |
| Nitrates: | | | | |
| Sodium | | 565,049 | 544,085 | 664,185 |
| Potassium, enriched | | 142,371 | 152,424 | 74,615 |
| Phosphates, guano | | 15,272 | 12,976 | 18,600 |
| Gem stones, lapis lazuli | kilograms | 15,450 | 7,844 | -- |
| Gypsum: | | | | |
| Crude | | 127,667 | 88,554 | 135,111 |
| Calcined | | 49,895 | 67,096 | 59,631 |
| Iodine, elemental | | 2,097 | 2,211 | 2,273 |
| Kyanite and related materials, andalusite | | NA | NA | 5,447 |
| Pigments, natural mineral, iron oxide | | 21,065 | 23,762 | 16,482 |
| Pozzolan | | 158,605 | 142,415 | 162,491 |
| Pumice | | NA | NA | 14,250 |
| Quartz: | | | | |
| Common quartz | | 169,913 | 139,589 | 202,624 |
| Glass sand | | 10,502 | 7,700 | |
| Salt, all types | thousand tons | 437 | 345 | 350 |
| Stone: | | | | |
| Limestone | do | 2,289 | 2,112 | 2,596 |
| Marble | | 2,658 | 785 | 497 |
| Sulfates, sodium: | | | | |
| Natural, mined | | 4,941 | 4,773 | 41,884 |
| Anhydrous, coproduct of nitrate industry | | 37,138 | 35,950 | |
| Sulfur: | | | | |
| Native, other than Frasch: | | | | |
| Refined, sulfur content | | 16,145 | 8,273 | 7,528 |
| Unrefined, sulfur content | | 62,090 | 22,835 | 24,672 |
| Sulfur content of acid derived from pyrite and industrial gases | | 18,088 | 15,945 | 23,310 |
| Total | | 96,323 | 47,053 | 55,510 |
| Talc | | r 2,615 | 1,758 | 1,684 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Coal, bituminous and lignite | thousand tons | 1,427 | 1,425 | 1,520 |
| Coke, coke oven | do | 308 | 300 | 303 |
| Gas, natural: | | | | |
| Gross production | million cubic feet | r 285,093 | 260,496 | 248,687 |
| Marketed | do | r 144,069 | 144,619 | 127,503 |
| Natural gas liquids, gross production: | | | | |
| Condensate | thousand 42-gallon barrels | 1,031 | 949 | 850 |
| Natural gasoline | do | 1,128 | 1,126 | 1,112 |
| Liquefied petroleum gas | do | 2,825 | 2,973 | 3,038 |
| Total | do | 4,984 | 5,048 | 5,000 |
| Petroleum: | | | | |
| Crude | do | r 12,526 | 11,429 | 10,055 |
| Refinery products: | | | | |
| Gasoline: | | | | |
| Aviation | do | 197 | 143 | 172 |
| Motor | do | 11,579 | 10,466 | 9,196 |
| Jet fuel | do | r 879 | 715 | 874 |
| Kerosine | do | 3,829 | 3,852 | 3,324 |
| Distillate fuel oil | do | 5,127 | 5,532 | 6,633 |
| Residual fuel oil | do | 9,818 | 9,793 | 11,177 |
| Other: | | | | |
| Liquefied petroleum gas | do | 2,689 | 1,999 | 5,520 |
| Naphtha | do | 577 | 529 | 509 |
| Asphalt, refinery | do | 45 | 46 | 66 |
| Unspecified | do | r 565 | 519 | 711 |
| Refinery fuel and losses | do | r 1,889 | 1,644 | 134 |
| Total | do | r 37,194 | 35,238 | 38,316 |

e Estimate. p Preliminary. r Revised. NA Not available.

[1] In addition to the commodities listed, lime, pyrites, and selenium are produced but available information is inadequate to make reliable estimates of output levels.

[2] Data given are the nonduplicative copper content of ores, concentrates, precipitates, metal, and other copper-bearing products measured at the least stage of processing reported in available sources.

[3] Figures presented are total blister and equivalent copper output including that blister subsequently refined in Chile and copper which is produced by electrowinning. Material produced for refining at Ventanas smelter is included.

[4] Figures presented are total refined output, distributed into two classes according to method of refining; output of Ventanas refinery is included.

[5] Excluding castings.

## TRADE

Copper export revenues were $1.57 billion for 1974, compared with $1 billion in 1973. This mineral commodity continued to contribute over 75% of Chile's foreign exchange earnings. While the average price received for Chilean export copper in 1974 was about 83 cents per pound, the sharp drop in London Metal Exchange (LME) copper quotations from a high of $1.52 in April to 53 cents at yearend represented a significant loss of potential revenue to the economy of Chile. CIPEC estimated the loss in export revenue to Chile at the rate of $20 million per year for each 1 cent reduction in price, for a total loss of over $1 billion in 1974.[4 5]

Major export shipments of copper in 1974 went to West Germany, Japan, the United States, the United Kingdom, and Italy. In addition significant amounts were also exported to the People's Republic of China (PRC), Canada, France, Brazil, and Argentina. Iron ore followed forest products as the third most important foreign exchange earner with 88% of the 1974 production exported for a value of $73 million. Next in trade importance was molybdenum with over 9,300 tons of exports worth an estimated $11 million. Chile earned approximately $67 million from nitrate and iodine exports, which represented 67% of sodium nitrate production, 74% of potassium nitrate production, and 114% of byproduct iodine production.

Exports of nitrate fertilizer commodities totaled 497,100 tons valued at $51,610,000, compared with 419,900 tons valued at $23,638,000 in 1973. Sodium nitrate exports went chiefly to Western Europe ($18 million), the United States ($13.8 million), and the PRC ($5.1 million). Shipments of potassium nitrate valued at $3.4 million went to the United States, and shipments valued at $1.3 million went to the PRC.

The country's balance of trade payments were seriously affected by increased petroleum prices and the necessity of importing 75% of 1974 requirements. Imports of 28.2 million barrels of crude petroleum cost $338 million, compared with 24.4 million barrels costing only $120 million in 1973.

Detailed trade data for 1973 and 1974 were not available at the time this chapter was written. The latest trade statistics available are those for 1972, and are contained in the 1973 Minerals Yearbook chapter.

## COMMODITY REVIEW

### METALS

**Copper.**—In its first full year of control, the new Chilean Military Government achieved a record copper production and promoted a renewed foreign investment climate. In addition to the new Decree Law 600, the Government settled all litigation and outstanding claims for compensation for the expropriation of privately owned mines in 1971. Cerro Corp. received an agreement for compensation of $41.9 million for its expropriated interests in Cia. Minera Andina, S.A. In July 1974, Chile agreed to pay The Anaconda Company $253 million, $65 million in cash and $188 million in promissory notes payable over 19 equal semiannual installments beginning in February 1975, for its interests in the Chuquicamata and El Salvador mines. In October 1974, Kennecott Copper Corp. received a net compensation for the takeover of its interests in Sociedad Minera El Teniente, S.A., of $68 million; $6.5 million was payable in cash and the remaining $61.5 million in 19 semiannual installments beginning in April 1975.

In December, Chile reimbursed the U.S. Overseas Private Investment Corp. $18.6 million for insurance payments paid to Anaconda for its expropriated interests in the Exótica mine, concluding all outstanding obligations on the part of the Government.

In conjunction with these actions the Foreign Investment Committee began soliciting bids for new foreign investment participation in the further exploration and development of the country's copper resources, which at yearend included eight known deposits with estimated combined

[4] U.S. Embassy, Santiago, Chile. State Department Airgram A-53, Mar. 31, 1975, 23 pp.
———. State Department Airgram A-107, June 25, 1975, 5 pp.
[5] Work cited in footnote 3.

ore reserves of 4 billion tons with a likely average grade of 0.8% copper. The committee is considering investment offers from over 12 companies with the cutoff date for bids on these deposits set at March 30, 1975. The four main properties being considered for development first include El Abra, with ore reserves reportedly estimated at 1 billion tons of 0.9% copper; Los Pelambres, with 430 million tons of 0.78% copper and 0.033% molybdenum; Andacollo, with a minimum estimated reserve of 100 million tons of 0.7% copper; and the Quebrada Blanca deposit. Other important deposits awaiting further exploration include Cerro Colorado, Mocho, Pampe Norte, El Salado, El Loicho, and Sierra Gorda.

Table 2 lists the main operating units responsible for the overall 23% increase in 1974 copper mine production. Cia. de Cobre Chuquicamata smelters and refineries produced 225,900 tons of electrolytic copper and 268,100 tons of blister copper, increases of 36% over the 166,100 tons of electrolytic and 38% over the 193,600 tons of blister copper produced in 1973. The purchase of new equipment and spare parts alleviated some of the problems encountered in 1973. Mine and mill operations were at near-capacity performance of 1,000 tons per day; however, a bottleneck at the smelter prevented attainment of its design capacity of 350,000 tons of copper per year. The smelter, which was designed for sea level, does not run efficiently at the mines 7,500-foot altitude. Plans underway to improve the present installation and to construct a new smelter would bring capacity up to 400,000 tons of copper.

In the interim, excess Chuquicamata concentrates are being treated in the Empresa Nacional de Minera (ENAMI) smelters at Ventanas and Paipote and at Cia. de Cobre El Salvador S.A.'s Potrerillos smelter. At the beginning of 1974 it was estimated that about 1.5 billion tons of proven ore grading 1.3% copper remained at Chuquicamata, with two to three times as much ore available at a 0.56% copper cutoff grade.

**Table 2.—Chile: Copper mine production, 1973–74**
(Metric tons, copper content)

| | 1973 | 1974 | Change, percent |
|---|---|---|---|
| CODELCO: | | | |
| Chuquicamata | 265,300 | 356,800 | +34 |
| Exótica | 31,800 | 32,200 | +1 |
| El Salvador | 84,000 | 80,000 | −5 |
| El Teniente | 178,100 | 225,500 | +27 |
| Andina | 56,100 | 68,400 | +22 |
| Total | 615,300 | 762,900 | +24 |
| Medium and small mines: | | | |
| Mantos Blancos | 28,900 | 32,200 | +11 |
| ENAMI | 73,300 | 71,200 | −3 |
| Disputada | 8,400 | 25,900 | +208 |
| Others | 9,500 | 9,900 | +4 |
| Total | 120,100 | 139,200 | +16 |
| Grand total | 735,400 | 902,100 | +23 |

Source: Corporación del Cobre. Departamento Estudios, Gerencia De Ventas Estadisticas: Producción y Exportacónes Chilenas, Año 1974.

Production at Exótica remained steady at 32,100 tons of electrolytic copper, representing only one-third of the 100,000-ton-per-year design capacity. Effective December 1, 1974, the Exótica mine was shutdown for a planned 6-month period to help meet the 10% reduction in copper exports agreed to by the CIPEC members. The high production costs at Exótica, estimated by a trade source at not less than 65 cents per pound, were also a factor in the closing.[6] Ore reserves at Exótica are estimated at 155 million tons of 1.35% copper. While the mine is closed, work will continue on the construction of a new solvent extraction plant to treat the complex oxide ore and to bring production up to original design levels.

El Salvador produced 63,257 tons of electrolytic copper at its Potrerillos refinery and 80,000 tons of blister copper; this was comparable to the 1973 electrolytic

[6] Work cited in second reference footnote 4.

output of 63,500 tons but a 5% decrease from 1973 blister production of 84,000 tons. The overall reduction in output is attributed to operations moving into a harder ore body than expected. Design capacity at El Salvador is 90,000 tons of copper per year. Ore reserves are estimated at 300 million tons of 1.25% copper.

Sociedad Minera El Teniente production of fire-refined copper at its Caletones refinery increased 61% to 85,200 tons, compared with 52,800 tons produced in 1973. An additional 87,800 tons of electrolytic copper was produced from El Teniente feed at the Ventanas refinery, an increase of 122% over 1973. Blister copper production from El Teniente concentrates increased 27% to 225,400 tons, compared with 177,900 tons in 1973. Output, however, was still only 84% of the rated capacity of 270,000 tons per year. The new reverberatory furnace came onstream in March 1974, eliminating some of the problems which held down blister copper output in 1973. Ore reserves at El Teniente, the world's largest underground copper mine, are estimated at 3.5 billion tons of 0.9% copper, including 350 million tons of 2.0% copper ore.[7]

Cia. Minera Andina, following the compensation agreement with Cerro Corp., continued to receive engineering consultation and technical services from Cerro. Production in 1974 of 68,400 tons indicated that the underground block-caving and concentration operations were working at full capacity. Ore reserves at Andina (Rio Blanco) are reported as 120 million tons of 1.6% copper.

ENAMI, the Government-controlled consortium of medium- and small-size mines, stopped marketing its copper through CODELCO in late 1974, and is now empowered to sell its output directly to consumers abroad. Development work on the $140 million open pit copper project at Andacollo continued during the year. Expansions were also underway to bring copper production at the Las Ventanas refinery up to 180,000 tons per year by 1976, with capacity eventually planned for 204,000 tons per year. Empresa Minera de Mantos Blancos, with ore reserves of 20 million tons of 1.6% copper, began trial underground mining operations and announced plans to invest $7 million to step up processing capacity by an additional 20 million tons of ore by 1984. Mantos Blancos increased production of fire refined copper 8% to 25,000 tons. Rebounding from the strike-troubled 1973 production year, Cia. Minera Disputada de las Condes S.A. (Disputada) produced a near-full-capacity 25,900 tons of blister copper in 1974. Ore reserves at the Disputada mines are estimated at 100 million tons of 1.4% copper.

Sociedad Minera Pudahuel Ltda., a medium-size copper complex near Santiago, announced plans to spend $40 million over the next 2 years to expand production of its Lo Aguirre copper deposits from 570 tons per day to 3,000 tons per day.

**Iron Ore.**—Production of iron ore totaled 10,292,000 tons, 10% greater than that in 1973. Chile ranked 14th in world iron ore production. Shipments of iron ore by Cia. de Acero del Pácifico, S.A. (CAP) exceeded 10 million tons for the first time. Increased shipments were reported from all mines; El Romeral accounted for the largest increase, 15%. Japan continued as the principal recipient with 83% of the total shipments, 6% more than in 1973. Shipments to the United States were 37% greater than in 1973, and deliveries to the Huachipato steel complex for domestic consumption were up 15% in 1974. Domestic and foreign shipments by mines are shown in table 3. CAP continued construction of a Japanese-financed iron ore pelletizing plant at Algarrobo. However the remainder of the Huasco Valley expansion project, including the development of a 3-million-ton-per-year iron ore mine at Bogueron Chanar and the expansion of port facilities at Guacolda, has been halted due to a lack of local currency financing. CAP is meanwhile conducting a feasibility study for a mining facility at the major Cerro Negro iron ore deposits in northern Chile.

[7] Sutulov, A. Copper Porphyries. The University of Utah Printing Services, Salt Lake City, Utah, 1974, p. 30.

Table 3.—Iron ore shipments by CAP in 1974
(Metric tons)

| Mine and product | Quantity |
|---|---|
| Romeral Division: | |
| Blast furnace ore to Japan | 1,410,911 |
| Blast furnace ore to Argentina | 47,531 |
| Blast furnace ore to CAP steel mill | 1,042,785 |
| Fines to Japan | 1,289,918 |
| Total | 3,791,145 |
| Santa Barbara-Santa Fe Division: | |
| Run-of-mine ore to Japan | 2,809,437 |
| Run-of-mine ore to Europe | 266,601 |
| Blast furnace ore to United States | 321,829 |
| Blast furnace ore to Argentina | 23,370 |
| Open hearth furnace ore to United States | 15,205 |
| Open hearth furnace ore to CAP steel mill | 35,784 |
| Total | 3,472,226 |
| Algarrobo Division: | |
| Blast furnace ore to Japan | 1,642,810 |
| Fines to Japan | 1,450,862 |
| Total | 3,093,672 |
| Total shipments by destination: | |
| Japan | 8,603,938 |
| United States | 337,034 |
| Europe | 266,602 |
| Argentina | 70,901 |
| CAP Huachipato steel mill | 1,078,569 |
| Total | 10,357,044 |

Source: Skillings' Mining Review. V. 64, No. 12, Mar. 22, 1975, p. 9. (Original data in long tons converted at a factor of 1 long ton equals 1.01605 metric tons.)

**Iron and Steel.**—Production of steel ingots totaled 635,300 tons, 17% more than in 1973. CAP, which accounts for about 94% of total output, operated at full capacity, producing 596,600 tons compared with 580,100 tons in 1973. Finished and semifinished steel mill products manufactured by CAP totaled 543,400 tons, 25% more than 435,000 tons produced in 1973. Total pig iron and cast iron production increased 16% in 1974 to 532,400 tons. Total domestic iron and steel shipments were 514,400 tons.

CAP plans to increase capacity at the Huachipato plant to 1 million tons following installation of continuous-casting equipment by late 1975 or early 1976.[8]

**Molybdenum.**—Chile attained third rank in the world in molybdenum production by more than doubling output to 9,757 tons of metal contained in 17,587 tons of concentrate. In addition, 1,460 tons of ferromolybdenum and 2,540 tons of molybdenum oxide were produced. Total production was recovered as a byproduct of copper operations at the Chuquicamata, El Salvador, and El Teniente plants. CODELCO continued plans to expand the Chuquicamata molybdenum plant and to increase production capacity to 13,600 tons per year. The expansion is scheduled for completion in late 1975 at a cost of $20 million and will also make Chile an important producer of rhenium. Chilean reserves of molybdenum contained in copper ores are estimated at over 2 million tons.

**Precious Metals.**—Gold production increased 21% to 118,829 troy ounces. Gold and silver ores accounted for 33% of the total gold output, and 67% was recovered as a byproduct of copper production. Production from copper ores increased 55% over that of 1973, more than offsetting a 28% decline in output from gold-silver ores.

Production of silver increased 32% to 6.65 million troy ounces, making Chile the world's eighth largest producer. Nearly 98% of the output was a byproduct of copper production. Lead-zinc ores and gold-silver ores each contributed about half of the remaining output.

## NONMETALS

**Cement.**—Chile is nearly self-sufficient in cement. Domestic production in 1974 increased over 3% to 1.43 million tons of portland cement. The scheduled opening of

[8] U.S. Embassy, Santiago, Chile. State Department Airgram A-41, Feb. 27, 1975, 10 pp.

Chile's fourth cement plant, INACESA, in early 1975 should allow Chile to become a modest exporter of cement to other Latin American countries within a year or two.

**Iodine.**—Production of iodine increased 3% in 1974 to 2,273 tons as Chile maintained its position as the world's second largest producer after Japan. Iodine was recovered as a byproduct of nitrates at three plants owned by Sociedad Quimica y Minera de Chile (SOQUIMICH).

**Nitrates.**—Nitrate production included 664,185 tons of sodium nitrate and 74,615 tons of potassium nitrate. Output of sodium nitrate was 22% greater than in 1973, but potassium nitrate production decreased 51%. Exports of sodium nitrate totaled 441,959 tons, compared with 349,608 tons in 1973. Of the total, 41% was shipped to Western Europe, 28% to the United States, and 11% to the PRC. Shipments of potassium nitrate totaled 55,177 tons in 1974; 48% went to the United States, 32% to the PRC, and 13% to Brazil. In late 1974 SOQUIMICH began plans for a $35 million expansion and modernization program. The expansion is expected to increase nitrate production to 850,000 tons in 1975 and to 950,000 by 1976, while iodine production is expected to increase about 14% to 2,600 tons per year. Construction of a new $10 million refinery for fine caliche is also included in the proposed expenditure.

## MINERAL FUELS

**Coal.**—Production of coal in 1974 totaled 1.52 million tons, a 7% increase over that of 1973. Receipts of metallurgical coal by CAP, which accounted for most of Chile's steel production, were 222,000 tons of domestic and 227,000 tons of imported coking coal, compared with 187,000 tons and 252,500 tons, respectively, in 1973. With lignite reserves estimated at 5 billion tons, Chile is watching the development of coal gasification technology very closely with the hope of exploiting this source of fossil fuel energy in the future.

**Petroleum and Natural Gas.**—Empresa Nacional del Petroleo (ENAP) completed 441 kilometers of reflectivity seismic exploration profiles in 1974, compared with 404 kilometers of reflectivity profiles in 1973. Drilling activity increased slightly. Sixty-seven holes with a cumulative length of 150,000 meters were drilled, compared with 65 holes and 136,216 meters in 1973. Magallanes Province accounted for 59 holes and 143,131 meters of the total length drilled; the remainder was in the south-central zone. The type of holes drilled and drilling results follow:

| Type of well | Number of completions | | | |
|---|---|---|---|---|
| | Petroleum | Gas | Dry | Total |
| 1973: | | | | |
| Exploration | 1 | 2 | 17 | 20 |
| Extension | -- | 1 | 3 | 4 |
| Development | 12 | 6 | 23 | 41 |
| Total | 13 | 9 | 43 | 65 |
| 1974: | | | | |
| Exploration | -- | 1 | 24 | 25 |
| Extension | -- | 1 | 5 | 6 |
| Development | 12 | 3 | 21 | 36 |
| Total | 12 | 5 | 50 | 67 |

Gross withdrawals of natural gas by ENAP totaled 248,687 million cubic feet, 5% less than in 1973. Mainland fields supplied 62% of the total, and Tierra del Fuego the remainder. Posesión Field (mainland) continued as the largest producing field with 35% of the total, followed by Daniel (mainland) with 12%, and by Tres Lagos and Cullen (both on Tierra del Fuego) with 10% and 9%, respectively. Of the total gas withdrawn, 49% was reinjected; 64% of the total withdrawn at Posesión was reinjected, 56% at Daniel, 67% at Cullen, and 89% at Calafate. A total of 127.5 billion cubic feet of natural gas was marketed or consumed by oil and gas production facilities. Production of natural gas liquids totaled 5 million barrels, 1% below that in 1973. Exports increased to 836,600 barrels from 337,100 barrels in 1973, and imports were 17,000 barrels compared with 434,200 barrels in 1973.

Reserves of natural gas in Chile are estimated at over 3.5 trillion cubic feet. ENAP is preparing plans for a liquefaction plant at Cabo Negro in Magallanes Province, near the gas deposits. Transportation facilities and regasifying installations in central and northern Chile, where the gas will be used, are also planned. At present, the lack of investment capital is delaying plans to establish an important petrochemical industry to further utilize the country's natural gas resources.

Crude petroleum production decreased 12% to 10,055,000 barrels, the lowest since

1961. Mainland fields across the Straits of Magellan produced 61% of the total production, and fields on Tierra del Fuego the remainder. All of the principal producing fields recorded decreased output for the year. Production by field for 1973 and 1974 was as follows:

| Location and field | Production (thousand 42-gallon barrels) | |
|---|---|---|
| | 1973 | 1974 |
| Mainland: | | |
| Daniel | 2,008 | 1,699 |
| Daniel Este | 1,656 | 1,529 |
| Posesión | 949 | 850 |
| Cañadón | 726 | 622 |
| Other | 1,313 | 1,390 |
| Total | 6,652 | 6,090 |
| Tierra del Fuego: | | |
| Calafate | 1,378 | 1,208 |
| Cullen | 1,012 | 812 |
| Tres Lagos | 844 | 728 |
| Other | 1,543 | 1,217 |
| Total | 4,777 | 3,965 |
| Grand total | 11,429 | 10,055 |

Source: Empresa Nacional del Petroleo, Chile. Boletin Estadistico, 4° Trimestre y Annual, v. 66, pp. 8, 42.

Imports of crude petroleum received at refineries totaled 28,209,000 barrels, 16% more than in 1973. Imports supplied 75% of the total petroleum refined in 1974, compared with 69% in 1973. Receipts of foreign crude petroleum comprised 92% of the total refined at the Concón refinery and 64% at the Concepción refinery. No imports were received at the Manantiales plant.

Refined petroleum production was 38,316,000 barrels compared with 35,238,000 barrels in 1973. The Concón refinery processed 16,122,000 barrels. Concepción 20,905,000 barrels, and the Manantiales gasoline plant 459,000 barrels, of which 318,000 barrels were credited to crude petroleum refining.

Chile's continued drop in crude oil production in 1974 was attributed to the exhaustion of deposits under exploitation and the lack of any major exploration effort. Production is expected to increase in 1976 with the delivery of drilling platforms to tap the 190 million barrels of proven reserves under the Straits of Magellan.

# The Mineral Industry of the People's Republic of China

By John E. Shelton [1]

Industrial growth in the People's Republic of China (PRC) has been variously estimated at 4.8% in 1974, down from the 10% annual rate of the last 3 years. Industrial production was reportedly on schedule for the fourth 5-year plan initiated in 1971.

Of major interest was the increasing output of crude petroleum by the PRC. Production of petroleum increased about 20% per year in the 1970's, reaching possibly 65 million tons in 1974. The three major fields, Taching, Takang, and Shengli, accounted for at least two-thirds of the output. Offshore exploration for oil was carried out in the Pohai Gulf and in the Yellow Sea near Shanghai.

Although fertilizer production increased considerably, the PRC was still dependent upon imports to fully meet requirements. To reduce the dependency on imports, the PRC has purchased ammonia or urea plants from various foreign companies.

The exchange of trade delegations continued and the PRC had trade agreements with 50 nations. Total foreign trade was more than $13 billion in 1974. Modern plants and technology for agriculture and industry were a significant part of the PRC's imports of about $7 billion. In addition to fertilizer plants, construction of petrochemical works, steel mills, and artificial fiber plants was acquired under contract. Modern mining machinery and technology for the drilling and recovery of oil were prominent acquisitions by the PRC. Imports of iron and steel were about 5 million tons of which Japan was the major source, exporting 2.9 million tons to the PRC.

Exports of $5 billion to $5.5 billion were predominantly industrial and mineral products. Exports of crude oil increased to 5 million to 5.5 million tons and became a significant source of export earnings. Japan was the major importer of crude oil as well as antimony, fluorspar, salt, and talc.

## PRODUCTION

The PRC is one of the world's leading producers and consumers of minerals, metals, and fuels. Little is known by the rest of the world about the PRC's mineral resources but assumptions and estimates made from historical data, occasional detailed reports, and international trade data indicate that production of some commodities is significant. Production of crude oil increased to 65 million tons in 1974. Steel production was estimated at 27 million tons. New blast furnaces were completed at the Anshan and Penchi iron and steel complexes. Output of chemical fertilizers was reported to be 15% higher in 1974 than in 1973. The PRC entered contracts with companies in Japan, Western Europe, and the United States for ammonia and urea plants which should increase production significantly over the next 2 or 3 years. Coal production was estimated at 450 million tons, up about 5%.

[1] Supervisory physical scientist, Division of Nonmetallic Minerals.

## Table 1.—People's Republic of China: Estimated production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| **METALS** | | | | |
| Aluminum: | | | | |
| Bauxite, gross weight [2] | | 550,000 | 600,000 | 600,000 |
| Alumina, gross weight | | 270,000 | 300,000 | 300,000 |
| Metal, primary, refined | | 140,000 | 150,000 | 200,000 |
| Antimony, mine output, metal content | | 12,000 | 12,000 | 12,000 |
| Bismuth, mine output, metal content | | 250 | 250 | 250 |
| Cadmium, smelter production | | 100 | 100 | 110 |
| Copper: | | | | |
| Mine output, metal content | | 100,000 | 100,000 | 150,000 |
| Metal, smelter | | 100,000 | 100,000 | 100,000 |
| Metal, refined | | 110,000 | 120,000 | 120,000 |
| Gold, mine output, metal content | troy ounces | 50,000 | 50,000 | 50,000 |
| Iron and steel: | | | | |
| Iron ore, gross weight [3] | thousand tons | 60,000 | 66,000 | 70,000 |
| Pig iron and ferroalloys | do | 30,000 | 33,000 | 35,000 |
| Crude steel | do | [4] 23,000 | [r] 27,000 | 27,000 |
| Rolled steel | do | 18,000 | 20,000 | 21,000 |
| Lead: | | | | |
| Mine output, metal content | | 100,000 | 100,000 | 100,000 |
| Metal, refined | | 100,000 | 100,000 | 100,000 |
| Magnesium metal, primary | | 1,000 | 1,000 | 1,000 |
| Manganese ore, gross weight | thousand tons | 1,000 | 1,000 | 1,000 |
| Mercury, mine output, metal content | 76-pound flasks | 26,000 | 26,000 | 26,000 |
| Molybdenum, mine output, metal content | | 1,500 | 1,500 | 1,500 |
| Silver, mine output, metal content | thousand troy ounces | 800 | 800 | 800 |
| Tin: | | | | |
| Mine output, metal content | long tons | 20,000 | 20,000 | 20,000 |
| Smelter | do | 20,000 | 20,000 | 20,000 |
| Tungsten, mine output, metal content | | 7,500 | 8,000 | 8,500 |
| Zinc: | | | | |
| Mine output, metal content | | 100,000 | 100,000 | 100,000 |
| Refined | | 100,000 | 100,000 | 100,000 |
| **NONMETALS** | | | | |
| Asbestos | | 160,000 | 160,000 | 160,000 |
| Barite | | 155,000 | 165,000 | 180,000 |
| Cement, hydraulic | thousand tons | 23,000 | 25,000 | 27,000 |
| Fertilizer materials: | | | | |
| Natural: | | | | |
| Crude phosphate rock | do | 2,000 | 2,300 | 2,500 |
| Potash, marketable $K_2O$ equivalent [5 6] | do | 280 | 300 | 340 |
| Manufactured, nitrogenous, N content [5 6] | do | 1,650 | 2,030 | 2,500 |
| Fluorspar | | 250,000 | 250,000 | 270,000 |
| Graphite | | 30,000 | 30,000 | 30,000 |
| Gypsum | | 600,000 | 630,000 | 650,000 |
| Magnesite | thousand tons | 1,000 | 1,000 | 1,000 |
| Pyrite: | | | | |
| Gross weight | do | 2,000 | 2,000 | 2,000 |
| Sulfur content | do | 900 | 900 | 900 |
| Salt | do | 18,000 | [r] 20,000 | 25,000 |
| Sulfur, elemental: | | | | |
| From sulfur ore | | 130,000 | 130,000 | 130,000 |
| Byproduct elemental | | 120,000 | 120,000 | 120,000 |
| Total | | 250,000 | 250,000 | 250,000 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | |
| Coal: | | | | |
| Anthracite | thousand tons | 20,000 | 20,000 | 25,000 |
| Bituminous and lignite | do | 380,000 | 410,000 | 425,000 |
| Total | do | 400,000 | 430,000 | 450,000 |
| Coke, all types | do | 24,000 | [r] 28,000 | 28,000 |
| Gas, natural: | | | | |
| Gross production | million cubic feet | [r] 300,000 | [r] 400,000 | 500,000 |
| Marketed production | do | 90,000 | 100,000 | 120,000 |
| Petroleum: | | | | |
| Crude (including crude from oil shale) | thousand 42-gallon barrels | 314,000 | 375,000 | 450,000 |
| Refinery products | do | 280,000 | 330,000 | 400,000 |

[p] Preliminary. [r] Revised.

[1] In addition to the commodities listed for which quantitative estimates of output have been made, the People's Republic of China is known or is believed to have produced the following commodities for which no estimates, even of order of magnitude, have been prepared, owing to a paucity of general information upon which to base an estimate: Arsenic, chromite, nickel, titanium minerals, uranium, boron minerals, various clays (including kaolin), feldspar, lime, mica, various industrial and dimension stones, sand, gravel, and carbon black. Other unlisted commodities also may be produced.

[2] Mostly diasporic bauxite; data shown include only bauxite for aluminum manufacture; in addition 100,000 to 200,000 tons was believed to be produced each year for making refractories.

[3] In terms of equivalent 50% Fe ore.

[4] Officially reported.

[5] Data are for year ended June 30 of that stated.

[6] Source: British Sulphur Corp. Ltd. Statistical Supplement No. 10, November–December 1974, pp. 18–19.

## TRADE

The PRC's total foreign trade was estimated at almost $13 billion up from $9 billion in 1973. Exports were $5 billion to $5.5 billion up from $4 billion and imports were $7 billion up from $4.7 billion in 1973. About 58% of the total trade value was with market economy countries and 19% with developing countries. The largest trading partner was Japan with $3.3 billion or more than one-fourth of the trade. The United States was the next in trade with $1.0 billion followed by Hong Kong with $900 millon. Trade with centrally planned economy countries was up about 4% to $1.9 billion; Romania and the U.S.S.R. were leading countries. Total trade with developing countries was about $2.4 billion.

Imports by the PRC were again led by agricultural products; however, grain imports declined about 10% by weight. Tonnage of steel, iron ore, and pig iron imports increased. Japan exported more than 2.9 million tons of steel to the PRC. Fertilizer imports declined. In 1974, Japan exported 620,850 tons (nitrogen content), down from about 900,000 tons in 1973.

The rise in exports was led primarily by an increase in exports of crude oil to 5 million to 5.5 million tons in 1974 from 1 million to 1.5 million tons in 1973. Japan was the leading importer with about 4.4 million tons. Exports of barite, fluorspar, and talc and steatite were up in 1974, while exports of antimony and salt declined. Except for tin, Japan was the major importer of these minerals.

**Table 2.—People's Republic of China: Apparent exports of selected mineral commodities [1]**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | r 72,945 | 99,913 | West Germany 39,240; Canada 38,655. |
| Oxide and hydroxide | 3,000 | 5,999 | All to Finland. |
| Antimony metal, unwrought | 150 | 250 | All to U.S.S.R. |
| Arsenic oxide and acids | 1,548 | 1,266 | All to Japan. |
| Copper metal including alloys, all forms | 152 | 100 | All to Italy. |
| Iron and steel metal: | | | |
| Pig iron, ferroalloys, and similar materials | 13 | -- | |
| Semimanufactures: | | | |
| Tubes, pipes, and fittings | r 609 | (2) | |
| Manganese ore and concentrate | r 44,359 | 47,750 | Mainly to Japan. |
| Mercury, 76-pound flasks | 1,450 | 1,973 | West Germany 1,073; France 609; Australia 290. |
| Tin metal including alloys, all forms: | | | |
| Scrap, long tons | [3] 10 | -- | |
| Unwrought, do | [4] r 5,515 | 8,024 | United States 1,727; France 1,642; Netherlands 905. |
| Titanium oxides | 701 | 625 | All to Japan. |
| Tungsten ore and concentrate | r 8,493 | 9,997 | U.S.S.R. 3,650; West Germany 1,874. |
| Other: | | | |
| Ore and concentrate, n.e.s.[5] | 2,257 | 3,099 | Mainly to Japan. |
| Oxides, hydroxides and peroxides of metals, n.e.s | [6] r 257 | [7] 445 | West Germany 156; Japan 92; Sweden 75. |
| Nonferrous metals including alloys, all forms n.e.s | [8] r 2,335 | [9] 3,089 | Japan 1,089; France 860; West Germany 346. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s value, thousands | $179 | $548 | Mainly to Belgium-Luxembourg. |
| Barite and witherite | r 63,671 | 61,828 | Japan 30,635; France 14,189; West Germany 9,704. |
| Boron materials, oxide and acid | 795 | -- | |
| Clays and clay products: | | | |
| Crude clays, n.e.s | r 30,626 | 23,939 | All to Japan. |
| Nonrefractory products value, thousands | [8] $32 | -- | |
| Diamond: | | | |
| Gem, not set or strung value, thousands | -- | $1,243 | Japan $703; Belgium-Luxembourg $432. |
| Industrial, do | $121 | $497 | All to Belgium-Luxembourg. |

See footnotes at end of table.

## Table 2.—People's Republic of China: Apparent exports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Feldspar and fluorspar: | | | |
| Fluorspar | 50,164 | 60,757 | U.S.S.R. 49,196; Poland 11,561. |
| Undifferentiated | 107,370 | 174,979 | Mainly to Japan. |
| Graphite, natural | r 7,075 | 8,954 | West Germany 4,625; United Kingdom 1,589; United States 1,454. |
| Magnesite | r 17,305 | 19,782 | United Kingdom 6,152; Japan 4,279; West Germany 3,115. |
| Mica, crude | 925 | 1,250 | All to United Kingdom. |
| Precious and semiprecious stones except diamond - value, thousands | r $2,595 | $3,927 | Japan $3,396; United States $394. |
| Salt thousand tons | 6,874 | [10] 99,360 | U.S.S.R. 99,360. |
| Sodium and potassium compounds, n.e.s., caustic soda | NA | 265 | All to Japan. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 4,189 | 6,351 | Do. |
| Worked | [11] 3,777 | [12] 4,433 | Japan 3,583; United Kingdom 555. |
| Gravel and crushed rock | 4,181 | 10,020 | All to Japan. |
| Quartz and quartzite | 6,161 | 13,638 | Do. |
| Sand, excluding metal bearing | 288 | 10,815 | Do. |
| Talc, steatite, soapstone, and pyrophyllite | r 155,294 | 195,201 | Mainly to Japan. |
| Other nonmetals, n.e.s.: | | | |
| Crude | r 2,158 | 3,807 | Italy 1,228; West Germany 1,109; Spain 1,040. |
| Slag dross and similar waste, not metal bearing from iron and steel manufacture | 11,935 | 11,300 | All to Japan. |
| Oxides and hydroxides of magnesium, strontium and barium | ([13]) | 2,025 | All to Italy. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal | r 250,522 | 293,622 | All to Japan. |
| Petroleum refinery products: | | | |
| Distillate fuel oil thousand 42-gallon barrels | 83 | -- | |
| Lubricants value, thousands | $27 | -- | |
| Other: | | | |
| Mineral waxes thousand 42-gallon barrels | r 92 | 124 | Italy 35; Australia 18; United States 18. |
| Petroleum coke do | 335 | -- | |
| Total do | r 510 | 124 | |

r Revised. NA Not available.

[1] Compiled from data of Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, the U.S.S.R., the United Kingdom, the United States, and Yugoslavia.

[2] Tonnage not reported. Exports to Australia were valued at $174,000, and to the United Kingdom at $104,000.

[3] Revised from none.

[4] Total excludes exports to United States valued at $639,000.

[5] Source does not give details on metals included in this category but presumably the figure consists chiefly of antimony, bismuth, and molybdenum.

[6] Total excludes exports to United States valued at $78,000.

[7] Total excludes exports to United States valued at $373,000.

[8] Total excludes exports valued at $1,123,000.

[9] Total excludes exports valued at $631,000.

[10] Total excludes exports to Japan valued at $9,487,000.

[11] Total excludes exports to United States valued at $31,000.

[12] Total excludes exports to United States valued at $65,000.

[13] Value of goods exported was $25,000.

Source: For Poland, the U.S.S.R., and Zambia—official import statistics of the respective country; for all other countries—Statistical Office of the United Nations. 1972 Supplement to the World Trade Annual. V. 5 (Far East), Walker and Co., New York, 1974, pp. 116–133, and the 1973 edition of the World Trade Annual. Vs. 1, 2, and 3, Walker and Co., New York, 1975.

## Table 3.—People's Republic of China: Apparent imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Oxide and hydroxide | 578 | 466 | All from Japan. |
| Metal including alloys: | | | |
| Unwrought | 61,519 | 72,430 | Norway 25,384; Canada 15,004; France 12,280. |
| Semimanufactures | (2) | 943 | Japan 452; United Kingdom 226; West Germany 126. |
| Cobalt metal, unwrought | -- | 200 | All from Zambia. |
| Columbium and tantalum metal including alloys, tantalum | 2 | -- | |
| Copper: | | | |
| Metal including alloys, all forms | 18,493 | 65,204 | United Kingdom 35,645; West Germany 9,007. |
| Iron and steel metal: | | | |
| Scrap, thousand tons | 163 | 518 | United States 394; Canada 124. |
| Pig iron, ferroalloys, similar materials, do | 474 | 756 | Australia 320; Yugoslavia 159; Netherlands 122. |
| Steel, primary, forms, do | r 10 | 233 | Mainly from Japan. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections, do | 370 | [3] 613 | Japan 458; West Germany 89. |
| Universals, plates, sheets, do | 1,181 | [4] 1,838 | Japan 1,452; West Germany 242. |
| Hoop and strip, do | 34 | 113 | Japan 68; West Germany 24. |
| Rails and accessories, do | r 43 | 20 | Canada 9; Australia 5; Canada 4. |
| Wire, do | 33 | 21 | Japan 14; West Germany 4; Sweden 2. |
| Tubes, pipes, fittings, do | r 465 | 673 | Japan 356; West Germany 279. |
| Castings and forgings, rough, do | 1 | (5) | All from Austria. |
| Total, do | r 2,127 | 3,278 | |
| Lead metal including alloys, unwrought | 7,277 | 10,023 | United Kingdom 9,023; West Germany 1,000. |
| Magnesium metal including alloys, unwrought | 301 | -- | |
| Manganese oxides | 150 | 800 | All from Japan. |
| Molybdenum metal including alloys, all forms | 4 | 1 | Do. |
| Nickel metal including alloys, all forms [6] | r 7,901 | 23,302 | Mainly from Canada. |
| Platinum-group metals including alloys, all forms, value, thousands | $9,800 | $15,608 | Japan $6,781; United Kingdom $5,377; United States $3,450. |
| Silver metal including alloys, do | $6,399 | $4,916 | Mainly from West Germany. |
| Titanium oxides | 125 | 1,923 | West Germany 660; United Kingdom 590; Belgium-Luxembourg 296. |
| Tungsten metal including alloys, all forms | 14 | 9 | All from Japan. |
| Zinc metal including alloys all forms | NA | 204 | All from Belgium-Luxembourg. |
| Other metals including alloys, all forms: | | | |
| Metalloids, n.e.s., value, thousands | NA | -- | |
| Base metals, n.e.s | r 227 | 379 | Belgium-Luxembourg 250; Japan 129. |
| **NONMETALS** | | | |
| Abrasives, natural, n.e.s., grinding and polishing wheels and stones, value, thousands | $41 | -- | |
| Asbestos, crude | 148 | 179 | All from Canada. |
| Clay products, refractory | 196 | -- | |
| Diamond: | | | |
| Gem, not set or strung, value, thousands | $12,131 | $13,729 | Mainly from United Kingdom. |
| Industrial, do | r $865 | $1,118 | Belgium-Luxembourg $864; West Germany $167. |
| Fertilizer materials: | | | |
| Crude, phosphatic | (7) | 36,792 | All from United States. |
| Manufactured: | | | |
| Nitrogenous, thousand tons | r 1,203 | 2,460 | Japan, 1,926; Italy 304. |
| Phosphatic, do | 41 | 82 | Spain 42; Greece 22; Belgium-Luxembourg 15. |
| Potassic, do | 21 | 77 | Canada 53; Belgium-Luxembourg 13; Spain 11. |
| Other including mixed, do | 31 | 109 | United States 44; Belgium-Luxembourg 38; West Germany 21. |

See footnotes at end of table.

Table 3.—People's Republic of China: Apparent imports of selected mineral commodities[1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Potassium compounds, n.e.s., potash, sodic, potassic peroxides | r 3,511 | 5,245 | Italy 3,767; Japan 1,323. |
| Sulfur, all forms | 191,140 | 277,200 | All from Canada. |
| Other nonmetals, n.e.s., halogens (excluding chlorine) | 80 | 29 | All from Japan. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | 1,846 | 852 | Do. |
| Petroleum refinery products: | | | |
| Lubricants thousand 42-gallon barrels | (5) | [8]3 | All from West Germany. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals[9] | r 14,087 | 12,016 | West Germany 12,016. |

r Revised. NA Not available.
[1] Compiled from export data of Australia, Austria, Belgium-Luxembourg, Bulgaria, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the U.S.S.R., the United Kingdom, the United States, Yugoslavia, and Zambia.
[2] Quantity was not reported for 1972. Total value in 1972 was $1,075,000 and $1,294,000 in 1973.
[3] Quantity reported excludes imports from Australia valued at $266,000.
[4] Quantity reported excludes imports from Australia valued at $768,000.
[5] Less than ½ unit.
[6] Quantity reported excludes imports from Japan valued at $54,000 in 1972 and $91,000 in 1973.
[7] Quantity not reported in 1972. Value was $3,203,000.
[8] Quantity reported excludes imports from Australia valued at $69,000.
[9] Quantity reported excludes imports from the United Kingdom valued at $83,000 in 1972 and $90,000 in 1973.

Source: For Poland and the U.S.S.R.—official export statistics of the respective country; for all other countries—Statistical Office of the United Nations. 1972 Supplement to the World Trade Annual. V. 5 (Far East), Walker and Co., New York, 1974, pp. 132–144, and the 1973 edition of the World Trade Annual. Vs. 1, 2, and 3, Walker and Co., New York, 1975.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Production of aluminum metal by the PRC was estimated at 200,000 tons in 1974. The major production of about 100,000 tons was at Fushun in Liaoning Province. An additional 20,000 to 30,000 tons was produced at Sanmen Gorge in Kansu with smaller quantities at Changling in Kirin, Wuhan in Hupeh, Hofei in Anhwei, and Nanning in Kwangsi. It is believed that plants of about a 40,000-ton capacity were under construction at Kweiyang in Kweichow Province and Sian in Shensi Province. Imports totaled about 100,000 tons of aluminum ingot.

The PRC has sizable resources of aluminum in offgrade diasporic material, aluminous shale, and bauxite. Reserves have been reported in Chekiang, Fukien, Honan, Hopeh, Kwangsi, Kweichow, Liaoning, Shantung, and Yunnan Provinces.

**Antimony.**—The PRC was a major world producer of antimony with an output of about 12,000 tons. In 1974, the United States imported 492 tons of antimony metal and 93 tons of antimony oxide from the PRC. Japan imported 1,994 tons of antimony ore and concentrate and 509 tons of metal from the PRC. Major world resources of antimony were in Hunan Province at Hsikwangshan mine near Hsin Hua.

**Bismuth.**—As a significant world producer, the PRC's output of bismuth was about 250 tons in 1974. Bismuth was recovered as a byproduct of tungsten and at nonferrous refining operations.

**Copper.**—Production of an estimated 150,000 tons of copper in the PRC was from several small mines. There also was a significant collection of scrap. Reported copper mines were the Tunghua in Kirin which produced 2,500 to 3,000 tons of copper, Hungtoushan and Huatung in Liaoning, Tungkuanshan in Anhwei, and the "No. 3 mine" in Yunnan. Production also was reported from the Tayeh, Hupeh, and Lanchow mines in Kansu. Extensive, low-grade porphyry copper deposits were reported several years ago, but there is no information that they have been developed. Copper was processed at a smelter and refinery at Shenyang in Liaoning Province and at a refinery at Shanghai. Smaller refineries are at Chungtiaoshan in Anhwei, Foochow in Fukien, Wuhan in Hupeh,

Chuchow in Hunan Kunming, Hochiochum and Wuwei in Kansu, Taiyuan in Shansi, and Chungking in Szechwan. A copper smelter in Fukien went onstream in 1972. Zambia agreed to ship 50,000 tons of copper to the PRC for a 4-year period beginning in 1972. Japan exported 32,700 tons to the PRC in 1974.

**Iron and Steel.**—Steel production was about 27 million tons in 1974. Increases in production at some operations may have been partially offset by problems at other complexes, such as the unknown extent of damage caused by the earthquake in Liaoning Province in February. It has been reported that steel production increased 3 million tons per year in the 1970–73 period.[2] It is estimated that more than 18 million tons was produced at major steel centers. Anshan Iron and Steel Company completed its 11th blast furnace and the Penchi Co. completed its 5th blast furnace.[3] The PRC has built many small and medium-sized plants, which now total more than four times the number in 1965. All provinces and autonomous regions except Tibet now have iron and steel enterprises. In 1974, about 11 million tons of scrap was collected throughout the PRC, of which about 5 million tons was new scrap.

Capacities of major Chinese steel plants are as follows:

| Plant | Province | Blast furnaces | Steel furnaces[1] | Steel capacity (metric tons per year) |
|---|---|---|---|---|
| Anshan | Liaoning | 11 | 25 OH | [2]7,000,000 |
| Wuhan | Hupeh | 8 | 6 OH | 2,500,000 |
| Taiyuan | Shansi | 5 | BOF and electric | 1,500,000 |
| Shanghai | Shanghai | 8 | Various | 3,000,000 |
| Peking | Peking | 3 | Oxygen converter | 1,500,000 |
| Penchi | Liaoning | 5 | OH and electric | [2]1,000,000 |
| Maanshan | Anhwei | 13 | OH and oxygen | 1,000,000 |
| Canton | Canton | 3 | OH and BOF | 1,000,000 |
| Paotou | Suiyüan | 1 | 2 OH and oxygen | 800,000 |
| Chungking | Szechwan | 3 | 2 OH | 800,000 |

[1] OH—open hearth furnace, BOF—Basic oxygen furnace.
[2] Capacities uncertain; estimates based on reported blast furnaces, increased use of scrap, and improved efficiencies.

The China National Technical Import Corp. and Nippon Steel Corporation concluded a 65,000-million-yen contract for facilities and equipment to construct a hot-strip mill and a silicon steel strip plant at Wuhan in Hupeh. When the plant is completed in 1977, it will have a capacity of 3 million tons of hot-rolled steel and 70,000 tons of silicon steel plate. The Federal Republic of Germany will build a cold-rolling mill at Wuhan with a capacity of 1 million tons of rolled steel. The contract valued at DM500 million will be completed in 1977.

The PRC imported more than 3 million tons of steel and steel products to meet its requirements. In addition, imports of pig iron and scrap combined were possibly 2 million tons. Japan exported more than 2.9 million tons to the PRC in 1974. Exports of steel scrap from the United States to the PRC were 189,000 tons valued at $12.4 million in 1974.

**Lead and Zinc.**—Production of lead and zinc was about 100,000 tons each in 1974. The largest mine was the Shin-kou-shan in Hunan. In Liaoning Province, the Hsiuyen mine and the Taoling mine produced lead and the Ching-ching mine produced lead and zinc. Other mines were in Anhwei, Fukien, Hunan, Kiangsi, Kwangtung, Kweichow, and Yunnan Provinces. A small mine and smelter were at Lienchen in Fukien. Other smelters were at Shenyang and Hulutao in Liaoning, at Sungpei in Hunan and at Shanghai. Other plants using scrap were mentioned at Wuhan, Canton, Changchun, and Kunming. The Imperial Smelting Process plant at Shaokuan in Kwangtung is believed to have a capacity of 35,000 tons of zinc and 18,000 tons of lead per year. There is no information that the smelter has been operated.

**Manganese.**—About 1 million tons of manganese ore was produced in the PRC. Major reserves are in Fukien, Hunan, Kiangsi, Kwangsi, Kwangtung, and Kweichow Provinces south of the Yangtze River. Manganese reserves also are found in Kansu and Liaoning Provinces.

[2] Federal Broadcast Informaton Service. V. 1, No. 208, Oct. 25, 1974, p. E6.
[3] Liaoning Provincial Service, Shenyang. Oct. 8, 1974.

**Mercury.**—The PRC continued to rank among the world's major mercury producers with an output of about 26,000, flasks in 1974. Production was mainly from Kweichow and Hunan Provinces with some from Kwangtung Province. Reserves are adequate to maintain the current rate of production. The PRC exported little mercury.

**Tin.**—Production of tin was estimated at 20,000 long tons. Output was primarily from Yunnan and Kwangsi Provinces. Ore from placer deposits in Kwangsi were the probable source of high-grade metal ingot, whereas the ore from lode deposits in Yunnan contain impurities that present refining problems. The PRC exported about 9,000 long tons of tin metal in 1974. Reported imports by France were 1,460 long tons; by the Netherlands, 1,460 long ton; by the Federal Republic of Germany, 610 long tons; and by the U.S.S.R., 500 long tons. Imports by the United States were 3,283 long tons, up from 1,727 long tons in 1973.

**Titanium.**—The PRC has adequate reserves of titanium ore to meet current needs. It is believed the PRC produced titanium dioxide, probably for use as white pigment for paint. There is no evidence of production of titanium metal.

**Tungsten.**—Output of tungsten was estimated at 17,000 tons of concentrates or 8,500 tons of tungsten metal in 1974. Several mines in Kiangsi Province produced 500 to 2,000 tons of wolframite concentrate. Scheelite was produced in Hunan Province. Reserves of tungsten, probably over 100 million tons, are in Hunan, Kiangsi, Kwangsi, and Kwangtung Provinces. Imports of tungsten concentrates by the U.S.S.R. from the PRC were about 3,650 tons in 1973 and about 3,000 tons in 1974. Imports of tungsten by the United States were 40.5 tons in 1973 and 172 tons in 1974. On the basis of imports reported by other countries through September, total exports by the PRC were estimated to be about 9,000 tons of tungsten concentrates in 1974.

**Uranium.**—Uranium ore was believed to have been produced at Chushan in Kiangsi Province and Weiyuan in Kwangtung Province. There is a gaseous diffusion plant in Lanchou in Kansu for use in nuclear testing. The PRC exploded a nuclear device of about 1 megaton (1 million tons of TNT) in the Løp Nor region on June 18, 1974. The previous test was that of a hydrogen bomb on June 27, 1973, in the same region.

## NONMETALS

**Asbestos.**—About 160,000 tons of chrysotile asbestos was produced in 1974, as the PRC continued to be among the top five world producers. The high-grade deposits at Shihmien in Szechwan Province accounted for most of the production of asbestos.

**Barite.**—The increase in demand for barite for the PRC's expanding petroleum industry resulted in an increase in the output of barite to about 180,000 tons. Japan imported 37,500 tons of barite and barium sulfate from the PRC in 1974 up from 30,000 tons in 1973.

**Boron.**—Deposits of boron-bearing minerals are known to occur in the Iksaydam area of Tsinghai Province. Data on production are not available; however, it is believed output exceeds demand. Japan imported 1,732 tons of sodium borate from the PRC in 1974.

**Cement.**—Production of cement in the PRC was estimated at 27 million tons in 1974 compared with 25 million tons in 1973. Several provinces reported increased production in 1974 and the PRC's small cement plants fulfilled the State plan 24 days early. Small plants numbering more than 2,400 accounted for about one-half of the total production. These small plants scattered throughout more than two-thirds of the counties in the PRC have helped in providing needed materials to build more water-control projects and improved farming conditions in the rural areas.[4] About one-third of the cement production was from about 60 plants with capacities between 100,000 and 1 million tons per year. Some of the larger known plants in the PRC are as follows:

| Plant | Province | Annual capacity (metric tons) |
|---|---|---|
| Hantan | Hopeh | 1,000,000 |
| Yao Hsien | Shensi | 1,000,000 |
| Huahsin | Hupeh | 1,000,000 |
| Kwangchow | Kwangtung | 700,000 |
| Yungteng | Kansu | 600,000 |
| Fushun | Liaoning | 550,000 |
| Chungking | Szechwan | 550,000 |
| Tangshan | Hopeh | 550,000 |
| Tatung | Shansi | 500,000 |
| Ch'ihsin | Liaoning | 400,000 |
| Mutanchiang | Kirin | 400,000 |
| Tungfanghung | Kiangsu | 400,000 |
| Kunming | Yunnan | 350,000 |
| Kweiyang | Kweichow | 300,000 |

[4] New China News Agency, Peking. Jan. 20, 1975.

**Diamond.**—Diamonds were produced at the Changte mine in western Hunan Province. Kweichow and Shantung Provinces also were reported to have deposits; however, it is not known if diamonds have been produced. Synthetic diamond may have been produced at Tsingtao in Shantung Province.

**Fertilizer Materials**—Production of chemical fertilizer material increased about 15% in the PRC in 1974. Over 20 large- and medium-sized plants were built or expanded.[5] Small fertilizer plants provided 55% of the total synthetic ammonia output. Small- and medium-sized plants were built near agricultural centers to meet local needs. These plants use local charcoal or coal as raw material for nitrogenous fertilizer.

Large fertilizer plants are located at Nanking and Yangchow in Kiangsu, Taiyüan in Shansi, Chuchow and Liling in Hunan, Kunming in Yunnan, Hofei in Anhwei, Tsinan in Shantung, Lanchou in Kansu, and in Kirin Provinces. Large fertilizer plants are being constructed near petroleum refineries. Plants reportedly are under construction at Lunan in Shantung, Anyang in Honan, Changsha in Hunan, and Hsuanwei in Yunnan Provinces. The PRC has contracted with several foreign companies to build ammonia or urea plants[6] as follows:

| Company | Product | Number | Capacity (thousand metric tons) |
|---|---|---|---|
| Kellogg Continental | Urea | 8 | 480 |
| M. W. Kellogg | Ammonia | 8 | 330 |
| Dutch States Mines | Urea | 3 | 574 |
| Mitsui Toatsu | Ammonia | 1 | 330 |
| Do | Urea | 1 | 528 |
| Heurtz et Cie | Ammonia | 2 | 330 |
| Do | Urea | 1 | 574 |
| Toyo Engineering | Ammonia | 1 | 330 |
| Do | Urea | 1 | 528 |
| Do | Ammonia or urea | 1 | 330 or 528 |

The PRC ranks third as a world consumer of nitrogenous fertilizer. Although production increased and plants were expanded or built, the PRC still imported large quantities of fertilizer to meet its needs. Japanese exports were down considerably from 1973 but still totaled 456,200 tons of ammonium chloride (26% nitrogen), 340,700 tons of ammonium sulfate (21% nitrogen), and 957,100 tons of urea (45% nitrogen) or a combined total of 620,850 tons of nitrogen content. Total nitrogen content of Japanese exports to the PRC in 1973 was about 900,000 tons. Additional imports were from Kuwait, Venezolana de Nitrogen (NITROVEN), Greece and two large consortiums, NITREX A.G. and ANIC, S.p.A.

The output of pyrites was estimated at 2 million tons in 1974. The recovered sulfur was primarily used for manufacturing fertilizers.

Production of phosphate rock in 1974 was about 2.5 million tons. Output was primarily from the Chinghsiang mine in Hupeh Province with a capacity of 600,000 tons, Kaiyang mine in Kweichow, Paotou mine in Inner Mongolia, and the Tunghaihsien and Haichow mines in Kiangsu. Other phosphate production was from Anhwei, Hunan, Kansu, Kwangsi, and Szechwan Provinces. By August phosphate ore production in Hupeh was up 55% over the corresponding period in 1973. Phosphate fertilizer output from 58 plants in Hupeh was up 18% for the same period. It was reported that phosphate ore production from a number of large mines in Hunan was 10 times greater in 1974 compared with 1965.[7] Imports of phosphate rock was about 1 million tons, principally from Morocco and North Vietnam. About 5,000 tons of mixed phosphate and superphosphate fertilizers was imported from Japan. Canada exported diammonium phosphate to the PRC.

Canada entered into a contract with the PRC to export 150,000 tons of potash valued at $8 million in the first half of 1974. Exports from Canada were about 170,000 tons valued at $9 million compared with $2.5 million exported to the PRC in 1973. It is believed the PRC has significant potash deposits in the Tarim Basin in Sinkiang Uighur Autonomous Region and in the Tsaidam Basin in Tsinghai.

**Fluorspar.**—Production of fluorspar was about 270,000 tons in 1974. Fluorspar was produced in Chekiang, Fukien, Hopeh, Hunan, and Kwangsi Provinces. The PRC exported about 200,000 tons of fluorspar in 1974 of which Japan imported 180,000 tons. Other exports may have been to the Federal Republic of Germany, Poland, and the U.S.S.R. Fluorine was recovered as a sodium fluosilicate byproduct of the phosphate industry.

[5] New China News Agency, Peking. Dec. 18, 1974.
[6] U.S. China Business Review. May–June 1974, pp. 36–38.
[7] Hunan Provincial Service. Feb. 20, 1975.

**Quartz Crystal.**—The PRC produced both natural and synthetic quartz crystals for use in the electronic industry. Japan imported 22,600 tons of natural quartz from the PRC.

**Salt.**—The PRC was the second largest world producer of salt with an estimated production of 25 million tons per year. By September the PRC's 1974 plan for production was fulfilled with production up 40% over the same period in 1973.[8] The major source of salt was solar evaporation of sea water in Hainan, Hopeh, Kiangsu, Liaoning, and Shantung Provinces. Improvements and modernization of several salt fields were reported. Output was up at the three major salt fields, Tangku in Hopeh and Luta in Liaoning Provinces, and Chilantai in Ningsia Hui Autonomous Region. Tangku, the largest producer, reportedly surpassed its 1974 plan by mid-June. The Chilantai salt field is a 120-square-kilometer inland salt lake. Salt was also produced at Hanku in Hopeh, Hsiangli in Hunan, Yunchan in Kiangsi, Peimu, Lantzuken, Hsiniuchiao and Chisha in Kwangsi, and Chengkou, Shoukuang and Tsingtao in Shantung and in Singkiang Province. Bedded deposits are in Hunan, Kiangsi, and Yunnan Provinces.

Byproduct potassium and magnesium compounds were recovered at many of the salt fields. In Szechwan, potassium salts, bromine, iodine and boron were also recovered from brine. The largest operation, Tzukung, produced about one-half of Szechwan's output of 1 million tons of salt. Salt and byproducts were recovered from Iksaydam Lake in Tsinghai.

With salt production in the PRC exceeding internal demand for food and industrial uses, a large quantity was available for export. The principal market was Japan, which imported 815,000 tons from PRC in 1974.

**Steatite and Talc.**—The PRC recovers steatite and talc at Taling in Liaoning Province. Japan imported 135,000 tons of talc and 68,000 tons of steatite from the PRC in 1974.

**Vermiculite.**—Vermiculite was produced from more than 20 operations in Linshu County in Shantung Province. Heat-insulating boards, brick, and pipe were manufactured using vermiculite with a cement binder.

## MINERAL FUELS

**Coal.**—Output of coal in 1974 was up about 5% with a production of about 450 million tons. Goals for coal production in Shansi Province, the PRC's largest producer, were met more than 30 days early.[9] Other Provinces reporting advanced fulfillment of production goals were Fukien, Honan, Hopei, Kweichow, Shansi, and Shantung. Output in Heilungkiang was up 5% and in Kwangsi up 10%.

Small coal mines accounted for 28% of the PRC's coal production in 1973.[10] About 60 large coal mine complexes accounted for about two-thirds of the production.

The largest complexes, Fushun and Fuhsin in Liaoning, followed by Huainan in Anhwei and Kailan in Hopeh produced in the 20 million-ton range. Combines in the 10 million- to 20 million-ton range were Tatung in Shansi and Hokang in Chihsi in Heilungkiang Province. Seven other large coal combines with several mines each supplied over 10 million tons per year. In the 5 million- to 10 million-ton range were Pingtingshan in Honan, Fengfeng in Hopeh, Peking and Tzupo in Shantung, and Yangchuan in Shansi. About 50 additional combines produced from 1 million to 5 million tons. Of these the more imporant were Chiaotso (Honan), Shuangyashan (Heilungkiang), Huaipei (Anhwei), Penhsi and Peipiao (Liaoning), Tsaochuang (Shantung), Hopi and Ima (Honan), Chinghsing (Hopeh), Tungchuan (Shensi), Tunghua (Kirin), Luan (Shansi), Shihchuaishan (Ningsia), Meitien (Kwangtung), Pinghsiang (Kiangsi), Hsuchou (Kiangsu), and Hsishan (Shansi). In Ningsia, anthracite production capacity has been increased 30%.

The remaining one-third of the production is from small- and medium-sized local mines which produce 100 to 1,000 tons per day. Because of transportation problems these local mines are important in supplying provincial agricultural and small industries. With the development in the last few years of mines in Sinkiang and Tibet, there is now production in all Provinces. Many remote areas in the southwest have become self-sufficient in coal.

China continues exploration to develop new deposits and to expand the small- and medium-sized mines. New coal mines were opened in 1974 such as an anthracite pit at the Yungting coal mining center in

[8] New China News Agency, Peking. Oct. 16, 1974.
[9] New China News Agency, Peking. Dec. 24, 1974.
[10] New China News Agency, Peking. Oct. 29, 1974.

Fukien, a shaft mine with a 600,000-ton capacity at Peipiao in Liaoning, and a mine with a 570,000-ton capacity at Chihsing in Heilungkiang Province.

**Petroleum and Natural Gas.**—Petroleum production in the PRC in 1974 increased 20% [11] to about 65 million tons. At least two-thirds of this output was from the north and northeast provinces; at Taching oilfield in Heilungkiang, at Shengli in Shantung, at Takang in Tientsin and in Liaoning and Kirin Provinces. Other producing areas, most of them small, are located in Hupeh, at Karamai in Sinkiang, at Lenghu in the Tsaidam Basin of Tsinghai Province, Yumen in Kansu, and Szechwan and Shensi Provinces. A small amount of oil shale was produced in Kwangtung and Liaoning Provinces.

At the Taching oilfield, output of crude oil in 1974 was five times the 1965 production, and refinery capacity was double the startup capacity in 1966. The 1974 production of crude was 22% higher than in 1973. The 5-year plan for Taching was met in 4 years.[12] Completion of a 1,152-kilometer, large diameter pipeline from Taching to the port of Chinhuangtao in Hopei was reported.[13] Construction was started to extend the pipeline to Peking. Also, a parallel line terminating at Tiehling in Liaoning Province was completed. Production of crude oil at the Takang oilfield increased almost 25% in 1974 compared with that of 1973. It was reported that the area of the Takang field was 40 to 50 kilometers along the coast, 40 to 50 kilometers inland, and well out into Pohai Bay south of Tientsin.[14] A new refinery with a 2.5 million-ton-per year capacity was near completion at Takang in 1974. The new refinery will be in addition to the 3.5 million-ton refinery built in 1965. The capacity of the refinery at Shanghai was reported to be three times that in 1964. The capacity of the Fushun No. 1 refinery in Liaoning was increased by technical improvements and a new dock to berth 50,000-ton tankers was completed at Chanchiang harbor in Kwangtung Province.

Japan imported 4.4 million tons of crude oil from the PRC in 1974. About 1 million tons of oil was exported by the PRC to North Korea and to North Vietnam.

Production of natural gas was up about 25%. The principal natural gas-producing area was in Szechwan Province and some was produced in Liaoning Province.

[11] New China News Agency, Peking. Jan. 2, 1975.
[12] Heilungkiang Provincial Service. Dec. 11, 1974.
[13] New China News Agency, Peking. Jan. 11, 1975.
[14] U.S. Consulate, Hong Kong. State Department Airgram A-318, Dec. 13, 1974, 1 p., encl. 1.

# The Mineral Industry of Colombia

By Daniel C. Adkins [1]

Colombia's mineral industry exhibited mixed results during 1974. Production of most mineral commodities increased; however, petroleum production declined for the fourth consecutive year. Petroleum, refined products, natural gas, precious metals, lime, and coal continued to rank as the country's most valuable mineral products.

The following government actions directly affecting Colombia's mineral industry occurred during 1974: (1) The Ministry of Mines and Energy increased the price of new oil from $1.64 to $4 per barrel [2] in order to stimulate production and exploration; (2) on January 1, 1974, the Government reduced the export tax credit (CAT) from 15% of export value to levels ranging from 0.1% to 5.0% of export value; (3) the Ministry of Mines and Energy supervised the transfer of ownership of the largest precious metals mine from foreign to domestic investors; and (4) the Government implemented a modified form of the Andean Pact Foreign Investment Code. Exceptions to the Code were made for the extractive industry to allow a 19% per year rate of return on total direct investment. A further 19% per year recovery of capital can be made on all profits reinvested in mining ventures. Companies are also allowed a sales commission for minerals sold abroad. The Code also requires that 90% of the technical and administrative staff must be Colombian by the 9th year of operations. Previous Colombian laws are still in effect concerning concessions, service contracts, and depletion allowances.

During 1974, projects and plans were initiated to diversify and expand the mineral industries in order to achieve mineral and mineral-based product self-sufficiency by 1980. This self-sufficiency is a national goal of Colombian public and private industries. Implementation of this goal ranges from the establishment of a financial policy to attract domestic and foreign capital, to the expansion of government-owned refinery capacity. The petrochemical sector will depend upon private, foreign and domestic, as well as State capital to expand production of specific chemicals beyond domestic needs. The excess production will be used to create a balanced chemical trade within the Andean region by the early 1980's. Similar financial arrangements are anticipated in petroleum exploration and development. Iron and steel expansion will be met by domestic industry with Government financial aid. Other industries, it is hoped will expand through initiative of foreign investment. The investment required to develop these industries as planned was estimated to be around $1 billion for iron, steel, nickel; $1.5 billion for petroleum refining and petrochemicals; $2.3 billion for petroleum exploration and development; and $120 million for coal mining and beneficiating.

[1] Physical scientist, Division of Petroleum and Natural Gas.

[2] Where necessary, values have been converted from Colombian pesos (Col$) to U.S. dollars at the exchange rate of Col$26.11 = US$1.00

## PRODUCTION

Production of metallic minerals was varied. Increases were registered in gold and iron ore; however, the production of steel and other metals declined notably. Among the nonmetals, significant production increases occurred in gypsum, salt, sulfur, and limestone.

Crude oil output declined for the fourth consecutive year as private companies encountered inadequate stimulus for investment. Total production was down 9.1% to 60.9 million barrels and would have been lower except for the expenditures by Empresa Colombiana de Petróleos (ECOPETROL) to maintain production in its De Marcs Field. Present producing fields have a rate of decline of around 12% per year which can be reduced by infield drilling, workovers, and injection techniques. Of the other fossil fuels output of refined petroleum products, natural gas, and coal increased, while that of coke declined.

**Table 1.—Colombia: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| **METALS** | | | | |
| Chromite, gross weight | | e 200 | 12,000 | e 12,000 |
| Copper, mine output, metal content | | 67 | e 70 | e 70 |
| Gold | troy ounces | r 188,137 | 215,876 | 265,195 |
| Iron and steel: | | | | |
| Iron ore and concentrate | thousand tons | 416 | 480 | 510 |
| Pig iron | do | 288 | 264 | 240 |
| Crude steel | do | 373 | 339 | 311 |
| Semimanufactures, hot rolled | do | NA | 265 | 270 |
| Lead, mine output, metal content | | 294 | 153 | 126 |
| Manganese ore, gross weight | | 492 | 12,000 | 6,000 |
| Mercury | 76-pound flasks | r 153 | 144 | 79 |
| Platinum-group metals | troy ounces | 24,111 | 26,358 | 21,094 |
| Silver | do | 69,678 | 75,416 | 75,354 |
| Zinc, mine output, metal content | | 85 | 146 | 37 |
| **NONMETALS** | | | | |
| Barite | | 6,306 | 1,922 | 2,500 |
| Cement, hydraulic | thousand tons | r 3,006 | 3,221 | 3,432 |
| Clays: | | | | |
| Bentonite | | e 1,000 | 1,260 | 1,000 |
| Kaolin | | 101,056 | 300,000 | 820,000 |
| Other | | 738,675 | | |
| Diatomite | | 357 | 350 | 550 |
| Feldspar | | 26,358 | 30,000 | 28,700 |
| Fertilizer materials: | | | | |
| Crude, phosphate rock | | 6,206 | 10,421 | 12,000 |
| Manufactured (gross weight): | | | | |
| Nitrogenous | | 112,133 | NA | NA |
| Phosphatic | | 42,159 | NA | NA |
| Other, including mixed | | 286,706 | NA | NA |
| Fluorspar | | 4,200 | e 4,000 | e 4,000 |
| Gypsum | thousand tons | 201 | 95 | 198 |
| Lime [e] | do | 1,000 | 1,000 | 1,000 |
| Magnesite | | e 1,800 | e 1,800 | 1,700 |
| Mica, all grades | | 38 | e 40 | e 40 |
| Precious and semiprecious stones, emerald: | | | | |
| Gem stone | thousand carats | [2] 1,750 | [3] 109 | e 1 |
| Morralla | do | NA | [3] 7,095 | e 4 |
| Salt: | | | | |
| Marine | thousand tons | 674 | 843 | 752 |
| Rock | do | 349 | 470 | 793 |
| Total | do | 1,023 | 1,313 | 1,545 |
| Sand (silice) | | 4,512 | NA | 360,000 |
| Stone: | | | | |
| Dolomite | thousand tons | 14 | 44 | 1 |
| Limestone | do | 4,900 | 7,000 | 7,620 |
| Marble | cubic meters | 2,000 | e 15,000 | NA |
| Quartzite | thousand tons | 181 | NA | NA |

See footnotes at end of table.

**Table 1.—Colombia: Production of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Sulfur: | | | | |
| From ore [e] | | 32,500 | 27,800 | 30,612 |
| Petroleum refinery byproduct [e] | | [r] 3,000 | [r] 3,000 | 3,000 |
| Total [e] | | [r] 35,000 | [r] 30,800 | 33,612 |
| Talc, soapstone, and pyrophyllite | | 2,247 | 900 | 800 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Carbon black [e] | | | | |
| Coal, all grades [e] | thousand tons | 20,500 | 22,500 | 25,000 |
| Coke, all types | do | 3,200 | 3,300 | 3,600 |
| Gas, natural: | | 524 | 540 | 400 |
| Gross production | million cubic feet | | | |
| Marketed production | do | 115,622 | 113,229 | 116,634 |
| | | [r] 65,420 | 65,045 | 65,792 |
| Natural gas liquids: | | | | |
| Propane (from natural gas) | thousand 42-gallon barrels | | | |
| Butane (from natural gas) | do | 1,220 | 1,271 | 1,268 |
| Natural gasoline | do | 726 | 733 | 718 |
| Total | do | 1,016 | 928 | 1,338 |
| Petroleum: | | 2,962 | 2,932 | 3,324 |
| Crude oil | do | 71,674 | 66,844 | 60,867 |
| Refinery products: | | | | |
| Aviation gasoline | do | 466 | 468 | 467 |
| Motor gasoline | do | 18,676 | 19,094 | 20,077 |
| Jet fuel | do | 1,545 | 1,801 | 2,091 |
| Kerosine | do | 2,997 | 3,134 | 3,329 |
| Distillate fuel oil | do | 8,986 | 8,144 | 8,439 |
| Residual fuel oil | do | 18,051 | 17,650 | 17,927 |
| Lubricants | do | 52 | 34 | 376 |
| Other: | | | | |
| Liquefied petroleum gas | do | 1,983 | 1,932 | 1,867 |
| Naphtha | do | 1,077 | 1,766 | 1,399 |
| Asphalt and bitumen | do | 915 | 730 | 767 |
| Petroleum coke | do | [e] 950 | | |
| Miscellaneous and unspecified | do | [e] 2,279 | 3,695 | 2,328 |
| Refinery fuel and losses | do | 1,357 | 1,265 | 1,026 |
| Total | do | 59,334 | 59,713 | 60,093 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to the commodities listed, coal briquets are also produced, but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels.
[2] May include gem stones other than emeralds.
[3] Exports.

## TRADE

Colombia ceased to be an exporter of crude petroleum in April 1974; however, exports of products, primarily residual fuel oil, remained constant. The value of petroleum exports more than doubled to $133.5 million. Increases in the world price of oil resulted in the largest national oil revenues at a time when Colombian oil production was declining. Product imports began in November 1974 with 259,000 barrels of gasoline. If current trends continue, Colombia will become a net importer by 1977.

Nonfuel mineral exports showed a decline partially as a result of revisions in the export tax credit system. The high value of emerald exports in 1973 and 1974, considering there was no emerald production, may have been related to tax credits for exports. The Bank of the Republic added gold purchases to its international reserves rather than utilizing these reserves in international sales. Much of the remaining mineral exports were composed of coal shipments to Venezuela and Brazil.

Nonfuel mineral imports, mainly phosphate rock, clays, and earths declined slightly to about $6 million.

Export value of minerals, in million U.S. dollars, were as follows:

| | 1972 | 1973 [r] | 1974 [e] |
|---|---|---|---|
| Emeralds | 46.1 | 75.0 | 25.0 |
| Gold | 2.5 | -- | -- |
| Platinum | 2.2 | 3.3 | 2.6 |
| Others | 1.1 | 2.7 | 4.7 |
| Crude oil | 30.8 | 25.4 | 4.5 |
| Refined products | 28.3 | 36.0 | 129.0 |
| Total | 111.0 | 142.4 | 165.8 |

[e] Estimated. [r] Revised.

Source: Bank of the Republic and Ministry of Mines and Energy.

## Table 2.—Colombia: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum metal including alloys, all forms | | 718 |
| Antimony ore and concentrate | | 78 |
| Chromium ore and concentrate | | 2 |
| Copper metal including alloys | | 954 |
| Gold: | | |
| Ore and concentrate | thousand troy ounces | 5,170 |
| Metal, unworked or partly worked | do | 81 |
| Iron and steel: | | |
| Metal | | 3,287 |
| Semimanufactures | | 40,347 |
| Lead: | | |
| Ore and concentrate | | 452 |
| Metal including alloys, all forms | | 33 |
| Manganese ore and concentrate | | 5 |
| Nickel semimanufactures | | 3 |
| Platinum-group metals and silver: | | |
| Waste and sweepings | troy ounces | 450 |
| Metals including alloys: | | |
| Platinum group | do | 25,913 |
| Silver | do | 215,442 |
| Selenium | | 1,090 |
| Tin metal including alloys | long tons | 51 |
| Tungsten metal including alloys, all forms | | (1) |
| Zinc metal including alloys, all forms | | 402 |
| Other: | | |
| Ore and concentrate | | 165 |
| Oxides, hydroxides, and peroxides of metals, n.e.s | | 57 |
| Base metals including alloys, all forms, n.e.s | | 5 |
| Metalloids | | 200 |
| **NONMETALS** | | |
| Abrasives, natural, n.e.s | | 32 |
| Asbestos | | 87 |
| Cement | | 316,189 |
| Clays and clay products (including all refractory brick) | | 9 |
| Fertilizer materials | | 10,426 |
| Fluorspar | | 314 |
| Gypsum and plasters | | 20 |
| Pigments, mineral, including processed iron oxides | | 10 |
| Precious and semiprecious stones, except diamond | kilograms | 2,244 |
| Salt and brine | | 25 |
| Sodium and potassium compounds, n.e.s | | 2,504 |
| Stone, sand and gravel: | | |
| Dimension stone, calcareous | | 351 |
| Gravel, crushed rock and sand | | 346 |
| Sulfur: | | |
| Elemental, all forms | | 275 |
| Sulfuric acid and oleum | | 334 |
| Talc, steatite, soapstone, and pyrophyllite | | 62 |
| Other, oxides and hydroxides of magnesium, strontium, and barium | | 3 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Asphalt and bitumen, natural | | 142 |
| Carbon black and gas carbon | | 10,284 |
| Coal, coke and peat | | 35,159 |
| Gases, rare (argon) | | 10 |
| Petroleum: | | |
| Crude | thousand 42-gallon barrels | 9,452 |
| Refinery products: | | |
| Distillate fuel oil | do | 3,296 |
| Residual fuel oil | do | 9,553 |
| Lubricants | do | 9 |
| Other: | | |
| Mineral jelly and wax | do | 144 |
| Unspecified | do | 60 |
| Total | do | 13,062 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | 10,151 |

[1] Less than ½ unit.

## Table 3.—Colombia: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum: | | |
| Bauxite and concentrate | | 3,658 |
| Oxide and hydroxide [1] | | 1,179 |
| Metal including alloys, all forms | | 13,927 |
| Antimony metal including alloys, all forms | | 21 |
| Arsenic anhydride and acid | | 129 |
| Bismuth metal including alloys, all forms | | 8 |
| Chromium: | | |
| Oxide and hydroxide | | 85 |
| Metal including alloys, all forms | | 8 |
| Cobalt oxide and hydroxide | | 7 |
| Copper metal including alloys, all forms | | 6,060 |
| Gold metal, worked or partly worked | value | $227 |
| Iron and steel: | | |
| Ore and concentrate | | 250 |
| Metal including alloys, all forms | | 19,780 |
| Semimanufactures | | 229,798 |
| Lead: | | |
| Oxides | | 1,956 |
| Metal including alloys, all forms | | 8,654 |
| Magnesium metal including alloys, all forms | | 43 |
| Manganese: | | |
| Ore and concentrate | | 958 |
| Oxides | | 1,466 |
| Mercury | 76-pound flasks | 894 |
| Nickel: | | |
| Unwrought | | 27 |
| Semimanufactures | | 268 |
| Platinum metal including alloys, all forms | value | $171 |
| Rare-earth oxides | | 2 |
| Selenium elemental | | 2 |
| Silver metal including alloys, all forms | thousand troy ounces | 3,685 |
| Tin metal including alloys, all forms | long tons | 335 |
| Titanium oxides | | 1,370 |
| Tungsten metal including alloys, all forms | | 4 |
| Vanadium oxide | | 21 |
| Zinc: | | |
| Oxide | | 704 |
| Metal including alloys, all forms | | 10,974 |
| Other: | | |
| Ore and concentrate, n.e.s | | 177 |
| Oxides, hydroxides, and peroxides of metals, n.e.s | | 47 |
| Metals including alloys, all forms, n.e.s | | 30 |
| **NONMETALS** | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | | 158 |
| Grinding and polishing wheels and stones | | 47 |
| Asbestos | | 19,656 |
| Barite and witherite | | 91 |
| Boron materials: | | |
| Crude and natural borates | | 1 |
| Oxide and acid | | 408 |
| Cement | | 677 |
| Chalk | | (2) |
| Clays and clay products (including all refractory brick): | | |
| Bentonite | | 3,217 |
| Kaolin | | 2,732 |
| Other | | 183 |
| Cryolite and chiolite | | (2) |
| Diamond, industrial | thousand carats | 80 |
| Diatomite and other infusorial earth | | 773 |
| Fertilizer materials, manufactured: | | |
| Nitrogenous | | 136,563 |
| Phosphatic | | 88,959 |
| Potassic | | 100,683 |
| Other | | 140,177 |
| Graphite, natural | | 40 |
| Gypsum and plasters | | 9,258 |
| Magnesite | | 134 |
| Mica, all forms | | 84 |
| Pigments, mineral, including processed iron oxides | | 995 |
| Precious and semiprecious stones, except diamond | kilograms | 111 |

See footnotes at end of table.

Table 3.—Colombia: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1973 |
|---|---|---|
| NONMETALS—Continued | | |
| Salt and brine | | 26 |
| Sodium and potassium compounds, n.e.s | | 4,962 |
| Stone, sand and gravel: | | |
| Dimension stone | | 271 |
| Dolomite, chiefly refractory grade | | 4,403 |
| Gravel and crushed rock | | 226 |
| Limestone (except dimension) | | (2) |
| Sand, excluding metal bearing | | 195 |
| Sulfur: | | |
| Elemental, all forms | | 15,044 |
| Sulfur dioxide | | 28 |
| Sulfuric acid and oleum | | 1,857 |
| Talc, steatite, soapstone, and pyrophyllite | | 1,070 |
| Other nonmetals, n.e.s.: | | |
| Crude, n.e.s | | 1,985 |
| Oxides and hydroxides of magnesium | | 263 |
| Bromine and iodine | | 17 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Asphalt and bitumen, natural | | 32 |
| Carbon black and gas carbon | | 712 |
| Coal, coke and peat | | 718 |
| Gas, hydrocarbon | | 580 |
| Hydrogen, helium and rare gases | | 39 |
| Petroleum: | | |
| Crude and partly refined | thousand 42-gallon barrels | (2) |
| Refinery products: | | |
| Gasoline (including naphtha) | do | 194 |
| Kerosine | do | (2) |
| Jet fuel | do | 40 |
| Distillate fuel oil | do | 16 |
| Residual fuel oil | do | 14 |
| Lubricants | do | 61 |
| Other: | | |
| Liquefied petroleum gas | do | 4 |
| Mineral jelly and wax | | 9 |
| Bitumen and other residues | do | 11 |
| Total | do | 349 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | 349 |

[1] Includes synthetic corundum.
[2] Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Copper.**—The Government opened international bidding for the development of the Cerro Pantanos-Pedegorcito copper deposits in the Department of Antioquia. Reserves have been estimated at 635 million tons of 0.8% copper ore. More than 20 foreign companies have expressed interest in the deposits, although no contracts have been signed. The Government plans to form a joint-venture group comprised of the Instituto de Fomento Industrial (IFI), the Government development agency, and 49% foreign participation.

**Iron and Steel.**—Acerías Paz del Rio, S.A. (A.P.d.R.), Colombia's largest iron and steel manufacturer, was planning a major expansion of its Belencito plant, from 300,000 tons per year crude steel capacity to a 1-million-ton capacity by 1980. The goal is to make Colombia self-sufficient in raw materials and free from any need to import finished steel. Government financial assistance is expected and will be needed to raise the nearly $800 million for this investment.

Electric steel output declined to its lowest level since 1970 as a result of a shortage of steel scrap. Colombia's six minor steel plants are dependent upon scrap from A.P.d.R. and foreign sources to operate their electric furnaces. These plants operated at half their combined 200,000-ton-per-year capacity.

**Nickel.**—Negotiations progressed on the Cerro Matoso ferronickel project when Hanna Mining Company and the Chevron

Oil Co. reached an agreement with the Government on foreign exchange aspects. The U.S. companies have been examining the details of the Government's terms and assessing the implications of Colombia's latest mining tax legislation. Thus, the contractual problems are being resolved. Before development commences, financing and marketing studies must be completed. A pilot plant is being constructed by Hanna Mining Company and Bechtel Corp. Total estimated investment may be near $200 million and production is projected to commence in 1979.

The lateritic nickel deposit involved in the project contains reserves estimated at 35 million tons with a 1.5% to 2.6% nickel content and is located in the Department of Córdoba. Initial production is not expected to begin until 1979. Project operations will be handled jointly by Empressa Colombiana de Niquel Limitada (ECONIGUEL), a subsidiary of IFI, and Compañía de Niquel Colombiano, S.A., equally owned by Hanna Mining Company and Chevron Oil Co. Although each of the three participants must contribute one-third of the investment required for the project, IFI retains 50% voting power.

**Precious Metals.**—Gold production increased 23% over that of 1973 in response to a sharp worldwide increase in gold prices. As the largest gold producer in Latin America, Colombia produced 265,000 troy ounces in 1974, the best showing since 1966. A further stimulus to production was the Government's subsidy of awarding producers the difference between the Bank of the Republic price ($44.22 per troy ounce) and the international free market gold price which ranged from $197.50 to $117.00 per troy ounce in 1974. Many old mines have reopened, some of which had been closed for more than 20 years.

The controversy over International Mining Corporation's (IMC) gold-dredging operations was resolved by selling 100% ownership of Cia. Minera Chocó Pacífico, S.A. and 60% ownership (all mining assets) of Pato Consolidated Gold Dredging, Ltd. to a recently formed company owned by Colombian citizens. This company, Mineros Colombianos, paid $12 million and $16 million for the respective IMC companies. Another local company is seeking to acquire the IMC-owned Frontino Gold Mines, Ltd. IMC and subsidiary companies have been contracted to provide technical assistance and other services to the new owners. IMC companies traditionally dominated the precious metal industry, accounting for approximately 60% of the country's gold and silver production and about 40% of its platinum output.

**Uranium.**—A Colombian-owned company Minuranio has found uranium deposits in the California district of Santander Department. Three European companies, Urangesellschaft m.b.H. of West Germany, Ente Nazionale Idrocarburi (ENI) of Italy, and Total—Compagnie Minière et Nucléaire of France initiated exploration for uranium during 1974.

## NONMETALS

**Asbestos.**—Work continued on the Las Brisas asbestos project, which will be the only operating asbestos mine in the Andean chain when completed in 1976. The project is located in the Department of Antioquia and is designed to process over 50,000 tons of fiber per year. Proven reserves of 18.2 million tons contain 4.3% fiber with a high proportion of asbestos fiber in grades 4 and 5.

Mining and milling facilities are to be operated by Asbestos Colombianas, S.A., in which Eternit Colombiana owns 70% interest and other private Colombian investors hold the remaining share. During 1974 Eternit Colombiana, representing European and Colombian interest, bought the share previously held by Nicolet Industries Inc. of Ambler, Pa., for $1.8 million. Eternit is the largest user of asbestos in Colombia and made the purchase as part of a long-term plan to gain control of its sources of raw materials. Total investment is estimated to be about $11 million. Full production will meet the needs of the Colombian market and will make it also possible to export half of the production.

**Emerald.**—The Government emerald mines remained closed in an effort to halt violence in the mining area. There are plans to allow private enterprise to lease the area and produce gem emeralds under strict government control. A new bidding for operations of the emerald mines received no offers during 1974.

**Salt.**—Overestimation of domestic demand and inability to develop firm export markets has resulted in large stocks and unused desalination capacity.

## MINERAL FUELS

**Coal.**—The Colombian Government and Peabody Coal Co. of the United States concluded a $120 million agreement covering the development of the El Cerrejon coal deposits. Surveys of the deposits indicate measured reserves amounting to 90 million tons of coal, plus a further 110 million tons of indicated reserves. Strip mining methods will be economical for 10 years after which the remaining reserves would be recoverable by underground mining. Production is projected to commence in 1981 with initial output of 5 million tons per year.

The Cayman Corp. of California reportedly has expressed interest in developing coal reserves of 500 million tons at Carare in the North Santander region.

**Natural Gas.**—The Colombian division of Texas Petroleum Co. (TEXPET), a subsidiary of Texaco Inc., reported the evaluation of the Chuchupa gasfield in the Department of Guajira indicated total reserves of 3.9 trillion cubic feet with a production capacity of at least 500 million feet per day. The Chuchupa gasfield seems to be an extension of the onshore Ballena gas pool located in the vicinity of the coastal town of Riohacha. All other Colombian gas reserves total 1.7 trillion cubic feet in widely dispersed natural gasfields. The Government issued a decree under its emergency powers giving natural gas production the same legal structures as petroleum. TEXPET can now receive its share of sales 75% in dollars and 25% in pesos with no remittance restrictions.

ECOPETROL and TEXPET have developed tentative plans to utilize production from the Guajira gasfield for ammonia and possibly urea production. If the price of natural gas rises and both firms can find additional partners with greater experience in chemical operations, then two ammonia plants with a 100,000-ton capacity will be built.

**Table 4.—Colombia: Salient statistics of the petroleum and natural gas industry**

| | 1972 | 1973 | 1974 |
|---|---|---|---|
| Crude oil: | | | |
| Production ---- thousand 42-gallon barrels -- | 71,674 | 66,844 | 60,867 |
| Delivered to refineries ---- do ---- | 56,657 | 56,966 | 58,767 |
| Exported ---- do ---- | 14,924 | 9,452 | 9,480 |
| Natural gas: | | | |
| Production ---- million cubic feet -- | 115,622 | 113,229 | 116,634 |
| Consumption [1] ---- do ---- | 60,787 | 59,966 | 61,090 |
| Injected ---- do ---- | 30,474 | 30,058 | 31,238 |
| Flared ---- do ---- | 19,727 | 18,125 | 19,604 |
| Natural gas liquids: | | | |
| Production ---- thousand 42-gallon barrels -- | 2,962 | 2,932 | 3,324 |
| Delivered to refineries ---- do ---- | e 1,150 | 1,434 | 1,275 |
| Refinery products: | | | |
| Refinery output [2] ---- do ---- | 59,334 | 59,713 | 60,093 |
| Consumption [3] ---- do ---- | 38,972 | 42,743 | 51,889 |
| Exported ---- do ---- | 12,427 | 13,062 | 10,471 |

e Estimated.
[1] Includes oil company use for fuel.
[2] Includes refinery losses and refinery fuel, but not treatment of natural gas liquids.
[3] Excludes LPG, aviation fuel to international carriers, and bunker sales.

**Petroleum.**—Exploration decreased to 50.5 party-months of seismic work and some gravimeter and surface geology as compared with 73 party-months of all types of exploration during 1973. Most work was concentrated in Guajira, Magdalera, and Boyacá Departments.

The number of exploratory wells remained at 17 while the total footage drilled decreased from 209,703 in 1973 to 171,507 feet in 1974. The only exploratory well which produced oil in commercial quantities was drilled by the Cayman Corp. in the Ptumayo region. Three other exploratory wells were gas producers. The Colombian subsidiaries of Continental Oil Co., Gulf Oil Corp., and Sun Oil Co., suspended all exploration

activities in 1974 due to lack of economic incentives.

ECOPETROL has developed a 10-year plan to increase the country's crude reserves from the present level of 627 million barrels. The plan calls for drilling 800 wells at a cost of $2.3 billion with ECOPETROL furnishing 35% of the capital.

Colombian crude petroleum production was down 9.1% to 60.9 million barrels. Petróleos Colombo-Brasileros (COLBRAS) was the only company to show a production increase. The other producing fields had a production decline rate between 8% and 16% per year. Most companies were unwilling to undertake operations to counter the decline in production with the price of old oil limited to $1.64 per barrel by the Ministry of Mines and Energy.

Domestic consumption of refined products increased by 21% to 51.9 million barrels. The increase of jet fuel and gasoline was 19% to 2.1 million barrels and 9% to 23.0 million barrels, respectively. This resulted in minor imports of gasoline late in 1974. Current refining structure will not meet domestic gasoline needs until new projects come on-stream in 1977 or later. Three-quarters of Colombia's gasoline consumption is by highly utilized public transportation. Gasoline prices range from $0.11 to $0.16 per gallon because of government subsidies that may have reached $50 million for 1974.

Table 5.—Colombia: Summary data on companies producing and/or refining crude oil during 1974

| Company | Principal ownership or affiliation | Nationality of ownership | Crude oil production during 1974 (thousand 42-gallon barrels) | Refining capacity as of Dec. 31, 1974 (thousand 42-gallon barrels) daily) |
|---|---|---|---|---|
| Antex Oil and Gas Co., Inc.[1] | Petroquimica del Atlántico and U.S. citizens. | Colombian/United States | -- | 2 |
| Chevron Petroleum Co. of Colombia | Standard Oil Co. of California | United States | 5,982 | -- |
| Colombia-Cities Service Petroleum Corp. (COLCITCO).[2] | Cities Service Co., ECOPETROL, AMOCO, and ARCO. | Colombian/United States | 2,110 | -- |
| Colombia Petroleum Co. (COLPET)[3] | ECOPETROL and Texaco, Inc | do | 5,180 | 6 |
| Empresa Colombiana de Petróleos (ECOPEROL).[4] | Colombian Government | Colombian | 15,769 | 160 |
| International Petroleum Colombia, Ltd. (INTERCOL). | Exxon Corp | United States | 7,063 | 5 |
| Petróleos Colombo-Brasileros (COLBRAS). | Colombian citizens and Petrobras. | Colombian/Brazilian | 2,032 | -- |
| Petrólera del Rio[5] | Texaco, Inc., ECOPETROL and Cayman Corp. | Colombian/United States | 15,890 | 1 |
| Texas Petroleum Co., (TEXPET) | Texaco, Inc | United States | 7,364 | 2 |
| Total | | | [6] 61,390 | 176 |

[1] Production included with Colbras.
[2] Cities Service, Ecopetrol, Amoco, and Arco each own 25%.
[3] Texaco and Ecopetrol each own 50%; Texaco share will revert to Ecopetrol in July 1975.
[4] Includes previous Shell properties purchased in early 1974.
[5] Texaco owns 50% and Cayman and Ecopetrol own 25% each.
[6] Figure differs from that shown on table 1 because of source.

Early in 1974 the Ministry of Mines and Energy increased the price of new crude oil to $4 per barrel in order to stimulate both production and exploration. The previous price of all crude sold to refineries was fixed at $1.64 per barrel which resulted in an effective rate of $1.55 per barrel since 25% of each crude payment is in pesos at a fixed rate (Col$20=US$1.00). Exceptions in pricing are made to encourage continued production in marginal fields. Unfortunately, the increase in price was almost immediately outdated by precipitate increases in production and exploration costs and failed to have the desired effect. Colombia's petroleum sector faces grave financial problems with up to $100 million needed to subsidize 1975 transportation costs and even larger capital outlays for refinery expansion, production, and exploration.

Early in 1974, ECOPETROL purchased the 46,000-barrel-per-day Cartegena refinery owned by International Petroleum (Colombia) Ltd. (INTERCOL), a subsidiary of the Exxon Corporation. The total sale price was near $40 million to be payed over a 3-year period. Technipetrol S.p.A. received a $15 million contract to expand refinery capacity to 60,000 barrels per day by 1977. ECOPETROL has also contracted Technipetrol S.p.A. to increase gasoline yielded at the Barrancabermeja refinery 15,000 barrels per day. The expansion is estimated to cost about $130 million and should be completed by early 1978. ECOPETROL awarded a contract to Foster Wheeler Corporation for construction of a 75,000-barrel-per-day refinery in the Pacific port of Tumaco. Completion of the first stage (40,000 barrels per day) is tentatively scheduled for 1980 with final completion due in 1982. Total cost, including port facilities is near $200 million. With completion of the Tumaco refinery, ECOPETROL will own 95% of Colombia's refinery capacity and achieve a great coordination of crude and product supply.

A dramatic expansion of the plastics and synthetic fibers industry has resulted in an overall production increase of 55% in chemicals from 1970 to 1973. If the proposed goals for Colombia's petrochemical sector are realized, production in 1980 may be four times greater then the 1.2 million barrels of petrochemicals produced in 1974. One factor aiding chemical growth has been the creation of the Andean Common Market.

In 1974 two petrochemical projects were completed while four projects were under construction. The Niigata Engineering Co. completed a 15,000-ton-per-year detergent alkylates unit for a subsidiary of Standard Oil Co. of California in Barrancabermeja. Petroquimica Colombiana S.A. started operating a 30,000-ton-per-year polyvinyl chloride plant in Cartegena that was designed by Diamond Shamrock Oil Company Ltd. and constructed by Admicol S.A. (ADMI) for $2.5 million. Projects under construction and planned are designed to produce carbon black, ethylene, polyester resin, low-density polyethylene, polystyrene, and terephtalic acid.

# The Mineral Industry of Cyprus

By E. Shekarchi [1]

The political conflicts that erupted July 15, 1974, were followed within days by armed confrontations between Greek and Turkish Cypriot military units, and effectively destroyed the mineral industry for the remainder of the year. By the end of 1974, Cyprus had become a bizonal island with the southern section controlled by the Government of Cyprus and the northern section by the Federated Turkish Cypriot State (FTCS), an autonomous Turkish Cypriot administration sponsored by the Government of Turkey. One of the largest companies in the country, the U.S.-owned Cyprus Mines Corp. (CMC), was compelled to cease its copper-mining operation in July because the dividing line between the Greek and Turkish Cypriots bisected its property. Although CMC kept several hundred employees in the southern part of the island on the payroll until the end of the year, no satisfactory solution to the conflict seemed in sight for the foreseeable future, and the firm decided to write off its Cyprus assets at yearend.

The Geological Survey Department (GSD) continued survey work in all parts of the country until July 1974. However, after the internal conflict began, not only were GSD's activities limited to the southern section of Cyprus, but many field operations and much exploration work was considerably shortened. Cooperative programs with international organizations and various departments on the island were similarly curtailed.

The preliminary gross national product (GNP) for 1974, based on 1973 dollars, was estimated at $912 million,[2] a 3.5% decrease compared with the 1973 GNP. Per capita GNP decreased 20% in 1974 compared with that of 1973.

Historically, foreign investors in Cyprus had been dominantly from the United States and the United Kingdom. However, following the energy crisis of 1973, new investors from Greece and the Middle East became interested in establishing new industries or investing in established ventures. The fate of the new, as well as the old, investments was not clear by the end of the year.

## PRODUCTION

Overall mineral production in 1974 decreased approximately 25% from that of 1973. Based on preliminary information, commodity production in the southern sector of the island was not as severely curtailed by the political crisis as it was in the northern sector. Except for a few gypsum, clay, and crushed stone and gravel operations, most mining ceased in the northern part of Cyprus after July 15. Cyprus Island Div. (CID), a subsidiary of CMC, was the leading producer of copper until July, when operations were closed down.

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[1] Physical scientist, Division of Ferrous Metals.

[2] Where necessary, values have been converted from Cyprus pounds (fC) to U.S. dollars at the rate of fC1=US$2.82.

Note: In October 1974, the FTCS adopted the Turkish currency as the official trade monetary unit in the northern sector of the country.

## Table 1.—Cyprus: Production of mineral commodities
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| **METALS** | | | | |
| Chromite ore and concentrate (marketable) | | 23,665 | 30,387 | 33,753 |
| Copper: | | | | |
| Mine output, metal content [2] | | [r] 16,506 | 17,092 | 11,557 |
| Cement copper, gross weight | | 5,577 | 4,387 | 2,692 |
| Precipitate copper, gross weight | | -- | 510 | [e] 400 |
| **NONMETALS** | | | | |
| Asbestos | | 29,780 | 31,706 | 31,456 |
| Cement, hydraulic | | [r] 427,599 | 456,851 | 343,798 |
| Clays, crude: | | | | |
| Bentonite [3] | | 10,921 | 8,885 | 4,572 |
| Other (unspecified) | thousand tons | 357 | 372 | [e] 280 |
| Gypsum: | | | | |
| Crude | | 11,665 | 39,450 | 20,321 |
| Calcined | | 8,179 | 10,305 | 5,080 |
| Lime, hydrated | | 83,349 | 83,942 | 57,305 |
| Mineral pigments: | | | | |
| Terre verte [3] | | 8 | 1 | 1 |
| Umber | | [r] 20,623 | [3] 12,675 | 14,585 |
| Yellow ocher | | [r] 297 | [3] 640 | 164 |
| Pyrite: | | | | |
| Gross weight: | | | | |
| Cupreous | | 51,578 | 107,013 | [3] 17,386 |
| Other | | 518,599 | 362,887 | [3] 286,932 |
| Total | | [r] 570,177 | 469,900 | [3] 304,318 |
| Sulfur content: | | | | |
| Cupreous | | 23,945 | 49,740 | 10,025 |
| Other | | 253,440 | 170,557 | 83,220 |
| Total | | [r] 277,385 | 220,297 | 93,245 |
| Salt, marine | | 5,765 | [r e] 6,000 | 3,551 |
| Stone, sand and gravel: | | | | |
| Limestone: | | | | |
| For cement production | thousand tons | 436 | 449 | [e] 340 |
| Other | do | 5 | 5 | [e] 5 |
| Dimension stone, marble | do | 57 | 51 | [e] 40 |
| Marl, for cement production | do | 197 | 211 | [e] 160 |
| Building stone, crushed and broken [4] | do | 1,433 | 1,616 | [e] 1,200 |
| Sand and aggregate [5] | do | [r] 3,857 | 3,440 | [e] 2,580 |
| Other: Slag, dross, similar waste not metal bearing | do | 4,336 | 3,180 | [e] 2,700 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | |
| Petroleum refinery products: | | | | |
| Gasoline | thousand 42-gallon barrels | 842 | 942 | 684 |
| Jet fuel and kerosine | do | 483 | 483 | 279 |
| Distillate fuel oil | do | 1,003 | 1,148 | 907 |
| Residual fuel oil | do | 1,670 | 1,307 | 891 |
| Other: | | | | |
| Liquefied petroleum gas | do | -- | 198 | 155 |
| Asphalt | do | 205 | 127 | 70 |
| Unspecified | do | -- | 460 | 367 |
| Refinery fuel and losses | do | 310 | 297 | 226 |
| Total | do | 4,513 | 4,962 | 3,579 |

[e] Estimate. [p] Preliminary. [r] Revised.

[1] In addition to the commodities listed, a variety of other crude construction materials are also produced, but information is inadequate to make reliable estimates of output levels.

[2] Includes the nonduplicative sum of copper content of ores, concentrates, cupreous pyrites, cement copper, and copper precipitates.

[3] Exports.

[4] Includes havara.

[5] Data excludes an amount reported on a volume basis only as follows: 1972—124,393 cubic meters; 1973—113,078 cubic meters; 1974—NA.

## TRADE

According to statistics published by the Ministry of Finance, December 1974, mineral exports totaled 422,481 tons, a decrease of 20.4% compared with the 1973 total. With world inflation and higher prices for all export commodities, the value of exports did not decrease significantly in 1974; the decrease was 0.75% compared with 1973 values. The most important mining products exported were, in order of value, cupreous concentrates, asbestos, iron pyrite, copper cement (precipitates), and chromium ore and concentrate.

## Table 2.—Cyprus: Exports and reexports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum, scrap | 162 | 159 | Italy 94; Spain 45. |
| Chromium, ore and concentrate | 23,692 | 30,387 | Austria 10,999; United Kingdom 7,201; Norway 5,150. |
| Copper: | | | |
| Concentrate | 65,776 | 65,005 | West Germany 31,563; U.S.S.R. 13,800; Spain 8,000. |
| Cement | 5,836 | 6,543 | All to West Germany. |
| Cupreous pyrite | 46,718 | 33,403 | Italy 17,283; West Germany 10,792; Netherlands 5,327. |
| Metal, scrap | r 331 | 788 | West Germany 289; Italy 170; United Kingdom 170. |
| Iron and steel metal: | | | |
| Scrap | 3,148 | 4,995 | Mainly to Italy. |
| Semimanufactures, tubes, pipes, fittings | 106 | 5 | All to Greece. |
| Lead, scrap | 370 | 602 | Netherlands 343. |
| NONMETALS | | | |
| Asbestos, crude | 27,988 | 28,999 | United Kingdom 8,676; Denmark 6,713; Greece 2,710. |
| Cement | 29,106 | 11,433 | All to Libya. |
| Clays and clay products | 11,044 | 8,883 | Mainly to Israel. |
| Gypsum | 116 | 23,242 | Mainly to Lebanon. |
| Lime | 3,465 | 14,356 | All to Libya. |
| Pigments, mineral | r 11,314 | 13,316 | United States 8,934; United Kingdom 3,140; Denmark 165. |
| Pyrites, unroasted | 460,170 | 363,772 | France 105,130; Greece 93,236; Italy 18,728. |
| Stone, sand and gravel | 1,507 | 902 | Israel 699; Libya 203. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Petroleum refinery products: | | | |
| Distillate fuel oil thousand 42-gallon barrels | 23 | -- | |
| Residual fuel oil ---------- do | 217 | -- | |

r Revised.

## Table 3.—Cyprus: Imports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum, including alloys, all forms | 1,555 | 2,417 |
| Copper, including alloys, all forms | 292 | 286 |
| Gold, including platinum-plated, unwrought and semimanufactures troy ounces | 22,856 | 16,545 |
| Iron and steel metal: | | |
| Pig iron, ferroalloys, similar materials | 181 | 894 |
| Steel, primary forms | 93 | 146 |
| Semimanufactures | 115,073 | 126,938 |
| Lead: | | |
| Oxides | 164 | 152 |
| Metal, including alloys, unwrought and semimanufactures | 334 | 395 |
| Nickel, including alloys, all forms | 10 | 12 |
| Platinum-group metals and silver metal, including alloys: | | |
| Silver troy ounces | 251,677 | 265,095 |
| Other silver and platinum-group metals, not differentiated value | $793 | $17,900 |
| Tin, including alloys: | | |
| Scrap long tons | 597 | -- |
| Unwrought and semimanufactures do | 388 | 588 |
| Titanium oxides | 175 | 215 |
| Zinc, including alloys, unwrought and semimanufactures | 452 | 450 |
| Other: | | |
| Unspecified metalliferous ores and metal scrap value | $19,223 | $116,686 |
| Metallic oxides of an unspecified nature | 29 | 111 |
| Nonferrous metals, n.e.s value | $57,248 | $30,658 |
| NONMETALS | | |
| Abrasives, natural, n.e.s., grinding and polishing wheels and stones do | r $99,352 | $115,418 |
| Barite and witherite | 25 | 43 |
| Cement | 8,901 | 9,470 |
| Chalk | 575 | 741 |
| Clays and clay products, including all refractory brick: | | |
| Crude clays, n.e.s | 279 | 310 |
| Products: | | |
| Refractory, including nonclay brick value | r $108,866 | $216,639 |
| Nonrefractory do | r $1,192,410 | $1,742,842 |

See footnotes at end of table.

Table 3.—Cyprus: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Diamond, gem, not set or strung | value | r $27,016 | $59,689 |
| Diatomite and other infusorial earth | | 119 | 128 |
| Fertilizer materials: | | | |
| Manufactured: | | | |
| Nitrogenous | | 42,864 | 41,721 |
| Phosphatic | | r 9,139 | 4,466 |
| Potassic | | 1,839 | 625 |
| Other, including mixed and unspecified | | r 41,659 | 56,328 |
| Ammonia | | 25 | 119 |
| Gypsum and plasters | | 22 | 63 |
| Lime | | -- | 19 |
| Pigments, mineral, natural, crude | | 175 | 4,698 |
| Precious and semiprecious stones, except diamond: | | | |
| Natural | value | r $30,125 | $47,834 |
| Manufactured | do | r $23,981 | $29,457 |
| Salt and brine | | 490 | 476 |
| Sodium and potassium compounds, n.e.s | | r 393 | 514 |
| Stone, sand and gravel, dimension stone | value | $137,751 | $293,339 |
| Sulfur: | | | |
| Elemental, other than colloidal | | 2,256 | 2,773 |
| Sulfur dioxide | | 133 | 93 |
| Sulfuric acid | | 314 | 357 |
| Talc, steatite, soapstone, pyrophyllite | | 301 | 313 |
| Other, building materials of asphalt, asbestos and fiber cement, unfired nonmetals, n.e.s | value | $850,082 | $1,342,886 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | | 623 | 506 |
| Coal, all grades, including briquets | | 98 | 131 |
| Coke and semicoke | | 625 | 569 |
| Peat, including peat briquets and litter | | 621 | 30 |
| Petroleum: | | | |
| Crude and partly refined | value, thousands | $12,827 | $16,077 |
| Refinery products: | | | |
| Gasoline, including natural | thousand 42-gallon barrels | 221 | 260 |
| Kerosine and jet fuel | do | 134 | 234 |
| Distillate fuel oil | do | 169 | 20 |
| Residual fuel oil | do | 969 | 709 |
| Lubricants | do | 54 | 61 |
| Other: | | | |
| Liquefied petroleum gas | do | 197 | 130 |
| Mineral jelly and wax | do | 2 | 2 |
| Nonlubricating oils, n.e.s | do | (1) | (1) |
| Bitumen and other residues | do | 6 | (1) |
| Bituminous mixtures, n.e.s | do | 8 | 8 |
| Unspecified | value | $28,303 | $34,694 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | do | $28,347 | $21,602 |

r Revised.
1 Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Chromite.**—Hellenic Mining Co. Ltd. (HMC), the only chromite producer in Cyprus, produced about 33,700 tons of chromite in 1974, an increase of 11% compared with 1973 output. HMC managed some exploration work on the right flank of the Kannoures ore body during the year, but no significant finding was reported.

**Copper.**—Both the Skouriotissa and Lefka mines of CID operated at full capacities during the first 6 months of the year, although the grade of mined ore was low. Operation of both mines and the Xeros copper concentrator was completely halted for the second 6 months of the year.

Operations of the other copper-producing companies—HMC, Kampia Mines Ltd., and Cyprus Sulfur and Copper Co.—suffered the same fate as CID during the year. At yearend, the total copper export decreased 21% compared with that exported during 1973. West Germany was the main recipient of cupreous pyrite and copper cement, followed by the U.S.S.R. and Spain.

### NONMETALS

**Asbestos.**—Cyprus Asbestos Mines Ltd. continued its operation without interruption, despite civil disturbances during the

year. Production of asbestos, both long and short fiber, was reported as 31,456 tons, 1% lower than that of 1973. Approximately 36,000 tons of asbestos of both kinds was exported during 1974. Recipients of Cyprus asbestos were Denmark, 8,398 tons; the United Kingdom, 7,190 tons; West Germany, 5,722 tons and nine other nations receiving from 100 to 5,000 tons. Because of demand in the European market for the type of asbestos that Cyprus produces, the future of this commodity remained bright at yearend.

**Cement.**—According to the Cyprus Statistics and Research Department, cement production decreased to 343,798 tons in 1974 from a high of 456,851 tons in 1973. Cyprus Cement Co. Ltd. and Vassiliko Cement Works Ltd. were the main producers. It was reported that a small, cement-pipe manufacturing company was organized toward the end of the year. Although the Cyprus Government imported cement pipes for its own projects, part of the production of the new industry was slated for export to Middle Eastern countries.

**Clays.**—*Bentonite.*—Exports of bentonite decreased 22% in 1974 compared with 1973 data. Production for the year was minimal; consequently, most of the bentonite exported in 1974 was from material stockpiled in 1973. Production of other clays on the island also showed substantial decreases during the year.

**Mineral Pigments.**—Among the mineral pigments, umber export remained important, although 1974 exports were 15.9% below those of 1973. Foreign exchange earned from umber export was close to $1 million. The main recipients of Cyprus umber were the United States, 6,930 tons, followed by the United Kingdom, 2,184 tons, and seven other nations receiving from 60 to 356 tons. Estimated exports of yellow ocher were 600 tons in 1974.

**Pyrite.**—The decline of pyrite production, attributed to a lack of interest by the European market as well as low-grade ore, continued in 1974. Production of pyrite was about 304,318 tons, 35% below 1973 production. Both HMC and CMC contributed iron pyrite for export by limited production and from 1973 stocks. No new findings of iron pyrite were reported during the year.

## MINERAL FUELS

The Offshore Oil Exploration law, drafted as part of a Commonwealth Assistance Program of the United Kingdom, was sent to Parliament for ratification in the first quarter of 1974. The fate of this legislation was not known by the end of the year. No offshore drilling was reported during the year.

Cyprus Petroleum Refinery Ltd. (CPR) operated at near capacity during the year. CPR is owned by Shell Oil Co., 25.5%; British Petroleum Co. Ltd., 15%; Mobile Oil Corp., 34%; and the Cyprus Government, 15%. Most of the refinery output was consumed locally. In addition, the Cyprus Government imported 4,000 barrels of gasoline, 162,000 barrels of jet fuel and kerosine, and 723,000 barrels of residual fuel oil to meet the national demand.

Crude petroleum imports for the year amounted to 3.8 million barrels and came from Saudi Arabia, 1.7 million barrels; Iraq, 1.6 million barrels; Iran, 124,000 barrels; and others, 296,000 barrels.

# The Mineral Industry of Czechoslovakia

By Nikita Wells [1]

In 1974, Czechoslovakia's overall volume of industrial production increased 6.2% over that of 1973. The largest growths were achieved in the engineering industry (8.5%), the building materials industry (8.2%), and in nonferrous metallurgy (7.7%). The Czechoslovak steel industry was expanding and expected to keep increasing its output well into the future. However, it was 94% dependent upon imported iron ores most of which came from the U.S.S.R.

The Czechoslovak economy was making excessive demands upon its fuel and energy supply. In 1974 demands exceeded available supply from 300 to 600 megawatts during winter months. In the future, increasing power consumption is to be covered partly by imports of fuel and electricity and partly by increased production from domestic nuclear and hydrolectric powerplants. Natural gas, which is to be imported from the U.S.S.R. through the Orenburg gas pipeline in increasing quantities, is to play a more prominent role in the primary energy balance in the future.

Domestic production of crude oil, which has been declining in the past years, covers only 1% of Czechoslovakia's present consumption requirements. Almost all of the required crude is now imported from the U.S.S.R. but in the future Czechoslovakia is planning to obtain more oil from countries of the Middle East and Africa. This oil is to be delivered through the Adriatic pipeline directly to Bratislava.

## PRODUCTION

Increases in production were achieved in 1974 in nearly all branches of the mineral industry. The extraction and processing of ores increased 8.1%; nonferrous metallurgy 7.7% and ferrous metallurgy 5.1%. Production of crude steel increased 3.7%, bringing the total output to more than 13.6 million tons, while that of pig iron was 8.9 million tons, representing an increase of 4.3% over that of 1973. Production of aluminum increased by 4.6%.

In the nonmetallic sector, Czechoslovakia has been expanding its cement, kaolin, and magnesite capacities. A total of 8.97 million tons of cement was produced in 1974, a 7.0% increase over that of 1973. The production of kaolin increased 7.6% and that of magnesite 8.5% over output in 1973.

The chemical industry, however, experienced considerable setbacks due to equipment breakdowns and delays in startup of new facilities. Overall production showed a 6.5% increase over that of 1973 which was less than planned. The production of nitrogen fertilizers increased by 9.9% due to larger outputs at the Sola nad Vahom and Zaluzi plants.

In the mineral fuels sector the total production of all ranks of coal in 1974 increased 1.2 million tons [2] or 1%, reaching 110.7 million tons. The production of coal in the Czechoslovakian Soviet Socialist Republic (C.S.S.R.) has remained steady at this level for the last 5 years. Domestic production of petroleum, however, con-

[1] Physical scientist, International Data and Analysis.

[2] Metric tons, unless otherwise specified.

tinued to drop and showed a 13% decrease in 1974.

The production of electricity in 1974 reached a level of more than 56 billion kilowatt-hours or an increase of 4.8% over that of 1973. This increase came primarily from hydroelectric powerplants due to a favorable water supply and by the startup of some new facilities.

**Table 1.—Czechoslovakia: Production of mineral commodities**

(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Alumina [e] | 85,000 | [r] 95,000 | 100,000 |
| Aluminum ingot, primary only | 42,713 | 47,646 | 49,844 |
| Antimony: | | | |
| Mine output, metal content [e] | 600 | [r] 700 | 750 |
| Metal [e] | 1,300 | 1,300 | 1,400 |
| Copper: | | | |
| Mine output, metal content | 4,700 | 4,500 | [e] 4,500 |
| Smelter [e] | [r] 7,000 | [r] 7,000 | 7,000 |
| Refined, including secondary | 18,068 | 17,840 | 20,848 |
| Iron and steel: | | | |
| Iron ore: | | | |
| Gross weight thousand tons | 1,581 | 1,672 | 1,688 |
| Metal content do | 474 | 502 | 506 |
| Pig iron and ferroalloys: | | | |
| Pig iron do | 8,332 | 8,507 | 8,871 |
| Blast furnace ferroalloys do | 28 | 27 | 34 |
| Electric furnace ferroalloys do | 116 | 122 | 127 |
| Crude steel do | 12,727 | 13,158 | 13,640 |
| Steel semimanufactures do | [r] 8,706 | 9,168 | 9,574 |
| Lead: | | | |
| Mine output, metal content | 4,917 | 4,683 | 3,896 |
| Metal, including secondary | 18,163 | 16,724 | 17,870 |
| Manganese ore, gross weight [2] | -- | 1,000 | 973 |
| Mercury 76-pound flasks | 6,614 | 6,498 | 5,540 |
| Nickel metal, primary [e] | [r] 1,000 | 1,200 | 1,500 |
| Silver [e] thousand troy ounces | [r] 1,250 | [r] 1,300 | 1,300 |
| Tin: | | | |
| Mine output, metal content long tons | 157 | [r e] 150 | 141 |
| Metal, including secondary do | [r] 90 | 90 | 120 |
| Zinc, mine output, metal content | 9,260 | 8,900 | [e] 9,000 |
| **NONMETALS** | | | |
| Barite [e] | 7,500 | 7,500 | 7,500 |
| Cement, hydraulic thousand tons | 8,045 | 8,381 | 8,967 |
| Clays, kaolin do | 422 | 450 | 484 |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous, nitrogen content | 343,501 | 350,672 | 385,407 |
| Phosphatic: | | | |
| Thomas slag, $P_2O_5$ content | 3,160 | 2,826 | 2,848 |
| Other, $P_2O_5$ content | [r] 331,092 | 333,552 | 333,187 |
| Fluorspar [e] | 90,000 | 90,000 | 90,000 |
| Gypsum and anhydrite, crude thousand tons | 501 | 578 | 629 |
| Lime (quicklime and hydrated lime) do | [r] 2,551 | 2,634 | 2,788 |
| Magnesite, crude do | 632 | 584 | 634 |
| Perlite [e] | 10,000 | 10,000 | 10,000 |
| Pyrite: | | | |
| Gross weight thousand tons | 328 | 290 | 296 |
| Sulfur content [e] do | 137 | 122 | 124 |
| Salt do | 224 | 235 | [e] 240 |
| Sodium carbonate, manufactured do | 120 | 122 | 112 |
| Stone, limestone and other calcareous do | 19,849 | 19,945 | NA |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Carbon black [e] | 15,000 | 15,000 | 15,000 |
| Coal: | | | |
| Bituminous thousand tons | 27,822 | 27,669 | 27,891 |
| Brown do | 81,726 | 78,237 | 79,171 |
| Lignite do | 3,840 | 3,592 | 3,619 |
| Total do | 113,388 | 109,498 | 110,681 |
| Coke: | | | |
| From bituminous coal: | | | |
| Metallurgical do | 9,073 | 9,165 | 9,306 |
| Unspecified [3] do | 1,606 | 1,666 | 1,592 |
| Total do | 10,679 | 10,831 | 10,898 |

See footnotes at end of table.

**Table 1.—Czechoslovakia: Production of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Coke—Continued | | | | |
| From brown coal | do | 474 | [e] 450 | NA |
| Fuel briquets (from brown coal) | do | 1,343 | 1,320 | 1,307 |
| Gas: | | | | |
| Manufactured, all types | million cubic feet | 274,005 | 277,289 | 274,394 |
| Natural, marketed [4] | do | [r] 41,035 | 36,798 | [e] 35,000 |
| Petroleum: | | | | |
| Crude: | | | | |
| As reported | thousand tons | 191 | 171 | 149 |
| Converted | thousand 42-gallon barrels | [r] 1,295 | 1,160 | 1,010 |
| Refined products: [5] | | | | |
| Gasoline | do | 10,532 | 11,466 | [e] 11,000 |
| Kerosine | do | 2,170 | 2,255 | 2,062 |
| Distillate fuel oil | do | 26,006 | 27,863 | 26,766 |
| Residual fuel oil | do | [r] 32,500 | 35,997 | [e] 33,000 |
| Lubricants | do | [r] 1,001 | 1,036 | 1,001 |
| Liquefied petroleum gas | do | 1,218 | 1,322 | [e] 1,250 |
| Asphalt and bitumen | do | 7,258 | 7,636 | [e] 7,300 |
| Total [5] | do | [r] 80,685 | 87,575 | 82,379 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, arsenic, gold, feldspar, graphite, uranium, a variety of additional crude construction materials (such as other clays, stone, sand, and gravel) and additional petroleum products are also produced, but information is inadequate to make reliable estimates of output levels.

[2] This material, although reported as manganese ore, is believed to be manganiferous iron ore, with a manganese content of about 17%, and as such is not equivalent to materials reported elsewhere as manganese ore, which generally contain 25% or more Mn.

[3] Derived by subtracting reported metallurgical and gashouse coke from reported total coke output.

[4] Includes gas produced from coal mines; gross output of natural gas is not reported, but it is believed to exceed reported marketed output by only a relatively inconsequential amount.

[5] Data presented are for those products reported in official Czechoslovakian sources and in the Statistical Yearbook of the United Nations; no estimates have been included for other products or for refinery fuels and losses.

## TRADE

Czechoslovakia's total foreign trade registered a new record of 85.2 billion korunas [3] as compared with 71.1 billion korunas in 1973. The share of the centrally planned economy countries decreased from 69.4% in 1973 to 66.1% in 1974, while that of other countries increased from 30.6% in 1973 to 33.9% in 1974. The value of imports in 1974 increased by 22.8% and that of exports by 16.7% over those of 1973 and thus the negative trade balance, which was 483 million korunas in 1973, further worsened and increased to a record 2.8 billion korunas in 1974.[4]

Czechoslovakia's main trading partner was the U.S.S.R. with a total turnover of 24,255 million korunas; East Germany was second with a 9,739 million korunas turnover; Poland third with 7,299 million korunas; and West Germany was fourth with 5,518 million korunas. Total imports from U.S.S.R. in 1974 increased by 11% in value over that of 1973 and included 14,291,000 tons of petroleum, 2,747,000 tons of bituminous coal, 3,231 million cubic meters of natural gas, 11,825,000 tons of iron ore, and 798,000 tons of pig iron. Imports of nonferrous metals from the U.S.S.R. supplied the basic requirements of the Czechoslovak industry. In 1974, Czechoslovakia imported 97,632 tons of aluminum, 38,705 tons of copper, 25,028 tons of lead, 22,844 tons of zinc, and 1,695 tons of magnesium.

The major Czechoslovak exports in 1974 included 3.7 million tons of bituminous coal; 1.4 million tons of brown coal; 2.5 million tons of coke; 297,000 tons of kaolin; 400,000 tons of magnesite; and a large unreported amount of uranium exported exclusively to the U.S.S.R.

[3] Official exchange rate is US$1.00=5.50 korunas (Kcs) (January 1975).

[4] Statisticke Prehledy, No. 4, April 1975, pp. 98–100.

## Table 2.—Czechoslovakia: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal destinations, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Metal and alloys: | | | |
| Scrap | 1,693 | 2,454 | Austria 2,229. |
| Unwrought and semimanufactures [3] | r 11,985 | 14,731 | France 3,952; West Germany 2,330; Switzerland 2,276. |
| Copper metal and alloys: | | | |
| Scrap | 977 | 287 | All to West Germany. |
| Unwrought and semimanufactures [3] | r 7,676 | 6,027 | West Germany 4,936. |
| Iron and steel: | | | |
| Ore and concentrate | r 53,413 | 42,288 | All to Austria. |
| Roasted pyrite | r 6,985 | 9,234 | Do. |
| Scrap [3] thousand tons | r 294 | 214 | Poland 158; West Germany 25. |
| Pig iron including cast, powder and shot do | r 26 | 33 | Sweden 21; Yugoslavia 7. |
| Ferroalloys [4] do | r 34 | 23 | West Germany 12; Austria 5. |
| Steel, primary forms do | r 306 | 306 | West Germany 107; Italy 100; Yugoslavia 92. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections [5] do | 1,231 | 1,113 | East Germany 157; Poland 144; West Germany 72. |
| Plates and sheets [5] do | 840 | 787 | West Germany 214; Poland 88; Yugoslavia 81. |
| Hoop and strip [5] do | 207 | 210 | Yugoslavia 53; Switzerland 24; East Germany 21. |
| Rails and accessories [5] do | 11 | 13 | Romania 6; East Germany 3; Poland 2. |
| Wire [5] do | 82 | 93 | West Germany 27; Hungary 17; Poland 16. |
| Pipes and tubes [5] do | 510 | 478 | U.S.S.R. 325. |
| Castings [3] do | 17 | 16 | All to Poland. |
| Total do | 2,898 | 2,710 | |
| Lead: | | | |
| Ore and concentrate | 3,397 | 8,885 | All to Belgium-Luxembourg. |
| Metal and alloys: | | | |
| Scrap | 429 | NA | |
| Unwrought and semimanufactures [3] | 259 | 1,070 | All to Poland. |
| Magnesium metal and alloys: | | | |
| Scrap | 982 | 3,639 | All to West Germany. |
| Unwrought and semimanufactures [6] | r 40,031 | 27,526 | All to East Germany. |
| Nickel metal and alloys: | | | |
| Scrap | r 1,330 | 591 | West Germany 531; Netherlands 60. |
| Unwrought | r 39 | 64 | All to West Germany. |
| Platinum-group metals: | | | |
| Unworked and partly worked value, thousands | r $25 | $406 | Do. |
| Waste and sweepings do | $188 | $178 | All to United Kingdom. |
| Tin ore and concentrates long tons | 136 | NA | |
| Titanium oxides | e 2,049 | 5,341 | Italy 1,040; Japan 848; France 820. |
| Tungsten ore and concentrate | 169 | 152 | All to West Germany. |
| Zinc: | | | |
| Ore and concentrate [3] | 20,564 | 11,048 | All from Poland. |
| Oxide | r 2,809 | 1,672 | Italy 624; France 500; West Germany 291. |
| Metal: | | | |
| Scrap | r 199 | NA | |
| Unwrought and semimanufactures [3 4] | r 5,029 | 2,688 | Romania 2,400. |
| Other, n.e.s.: | | | |
| Ash and other nonferrous base metal bearing residues | r 4,064 | 1,669 | Netherlands 1,031; West Germany 511. |
| Metal, all forms | r 311 | 215 | West Germany 115; Spain 84. |
| **NONMETALS** | | | |
| Abrasives: | | | |
| Pumice, emery and other natural abrasives | r 1,184 | 266 | All to Yugoslavia. |
| Grinding stones | r 145 | NA | |
| Barite | r 14,665 | 20,606 | All to West Germany. |
| Cement, hydraulic [7] thousand tons | r 102 | 101 | Hungary 51; West Germany 20. |
| Clays and clay products: | | | |
| Crude: | | | |
| Fuller's earth [3] do | 4 | 4 | All to Poland. |
| Kaolin [3] do | r 243 | 266 | West Germany 77; Poland 50; Austria 25. |
| Unspecified [4] do | r 454 | 490 | West Germany 218; Austria 55; Romania 48. |

See footnotes at end of table.

Table 2.—Czechoslovakia: Exports of selected mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Clays and clay products—Continued | | | |
| Products: | | | |
| Nonrefractory -- thousand tons -- | 21 | 38 | Yugoslavia 13; West Germany 10; Austria 9. |
| Refractory [7] ---------- do ---- | 70 | 72,120 | Hungary 64,375. |
| Diamond ---------- value, thousands -- | r $48 | NA | |
| Fertilizer materials: | | | |
| Manufactured, nitrogenous [7] -------- | r 25,031 | 10,030 | West Germany 4,697; Italy 2,902; Switzerland 2,300. |
| Ammonia ---------- | -- | 4,564 | All to Yugoslavia. |
| Graphite ---------- | (9) | NA | |
| Magnesite [8] ---------- thousand tons -- | 207 | 204 | Poland 65; Hungary 59; West Germany 31. |
| Mica, all forms ---------- | r 50 | 78 | Italy 34; West Germany 29; Yugoslavia 19. |
| Pigments, iron oxides ---------- | 271 | 1,713 | Italy 1,463; Yugoslavia 250. |
| Sodium and potassium compounds: | | | |
| Caustic soda ---------- | (9) | 195 | All to Yugoslavia. |
| Caustic potash [10] ---------- | r 4,862 | 316 | Do. |
| Soda ash ---------- | r 17,862 | 9,499 | Yugoslavia 7,322; West Germany 2,177. |
| Stone, sand and gravel: | | | |
| Dimension stone, crude and worked - | r 48,497 | 44,476 | All to West Germany. |
| Gravel and crushed rock ---------- | 26,139 | NA | |
| Sand ---------- | 54,066 | 49,993 | All to Austria. |
| Sulfur: | | | |
| Elemental ---------- | -- | 1,997 | All to Italy. |
| Sulfuric acid ---------- | 3,158 | NA | |
| Talc [3] ---------- | 3,812 | 4,309 | All to Poland. |
| Other nonmetals, n.e.s.: | | | |
| Slag, dross and waste not metal bearing ---------- | r 24,278 | NA | |
| Unspecified ---------- | r 6,603 | 4,331 | All to West Germany. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt, natural ---------- | r 1,636 | NA | |
| Carbon black ---------- | r 200 | 738 | All to West Germany. |
| Coal: | | | |
| Bituminous [8] ------ thousand tons -- | 3,310 | 3,480 | East Germany 711; Austria 697; Hungary 597. |
| Lignite [8] ---------- do ---- | 1,255 | 1,265 | West Germany 1,233. |
| Coke and semicoke [8] ---------- do ---- | 2,417 | 2,573 | East Germany 801; Romania 597; Austria 588. |
| Petroleum: | | | |
| Partly refined thousand 42-gallon barrels -- | 2,359 | 441 | Austria 414; Yugoslavia 27. |
| Refinery products: | | | |
| Gasoline ---------- do ---- | r 214 | 1,443 | Austria 1,316. |
| Distillate fuel oil [7] ------ do ---- | 2,911 | 2,620 | Switzerland 1,199; West Germany 1,055; Hungary 341. |
| Residual fuel oil ------- do ---- | 582 | NA | |
| Lubricants ---------- do ---- | 48 | 22 | Austria 18; Yugoslavia 4. |
| Other: | | | |
| Liquefied petroleum gas ---------- do ---- | 189 | NA | |
| Unspecified --------- do ---- | r 551 | 634 | West Germany 198; Austria 162; Yugoslavia 138. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ------- | r 39,436 | 41,864 | West Germany 27,168; Italy 6,024. |

r Revised. NA Not available.
[1] Compiled from the 1972 Supplement to the World Trade Annual, Walker and Company, New York, 1974.
[2] Compiled from the 1973 World Trade Annual, Walker and Company, New York, 1975.
[3] Source: Official Polish Trade Statistics.
[4] Source: Official Romanian Trade Statistics.
[5] Source: Statistics in World Trade in Steel 1973, United Nations, New York, 1974.
[6] Source: Official East Germany Trade Statistics.
[7] Source: Official Hungarian Trade Statistics.
[8] Source: Official Czechoslovakian Trade Statistics.
[9] Less than ½ unit.
[10] Source: Official Trade Statistics for the U.S.S.R.

## Table 3.—Czechoslovakia: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Alumina | 45 | NA | |
| Bauxite and concentrate [3] thousand tons | r 445 | 449 | Hungary 266; Yugoslavia 136; India 48. |
| Metal and alloys: | | | |
| Scrap | r 1,475 | 2,591 | All from Austria. |
| Unwrought [4 5] | r 127,204 | 98,102 | U.S.S.R. 90,244; Poland 4,243. |
| Semimanufactures [4 5] | r 17,931 | 24,485 | U.S.S.R. 13,707; Yugoslavia 9,194. |
| Cadmium metal, all forms [3] | 255 | 249 | U.S.S.R. 196; Bulgaria 15; United Kingdom 13. |
| Chromium, chromite [3] thousand tons | r 161 | 182 | U.S.S.R. 101; Albania 37. |
| Copper: | | | |
| Ore and concentrate | 1,294 | 5,754 | All from Austria. |
| Metal including alloys: | | | |
| Unwrought [4 5] | 39,274 | 42,047 | U.S.S.R. 37,743; Poland 4,243. |
| Semimanufactures [5] | 14,828 | 22,620 | Poland 9,707; West Germany 7,028; Yugoslavia 4,654. |
| Iron and steel: | | | |
| Ore and concentrate thousand tons [6] | r 13,152 | 13,211 | U.S.S.R. 11,557; India 691. |
| Scrap do | 2 | 8 | Mainly from West Germany. |
| Pig iron [3] do | r 802 | 730 | U.S.S.R. 726. |
| Ferroalloys [4] do | 113 | 115 | U.S.S.R. 113. |
| Steel, primary forms [5] do | r 46 | 91 | Mainly from Poland |
| Semimanufactures: | | | |
| Bars, rods, sections [7] do | 104 | 97 | U.S.S.R. 57; Poland 35. |
| Plates and sheets [5 7] do | 356 | 332 | U.S.S.R. 191; West Germany 65; Poland 51. |
| Hoop and strip [7] do | 11 | 8 | Austria 3; West Germany 3; Poland 1. |
| Rails and accessories [7] do | r 5 | 47 | U.S.S.R. 20; Poland 10. |
| Wire do | 4 | 3 | West Germany 2; Belgium-Luxembourg 1. |
| Pipes, tubes, fittings [7] do | r 76 | 27 | Yugoslavia 8; West Germany 7; Bulgaria 3. |
| Castings and forgings [5] do | r 3 | 7 | Yugoslavia 4; Austria 1. |
| Total do | r 559 | 521 | |
| Lead: | | | |
| Oxides | r 3,170 | 1,349 | All from France. |
| Metal including alloys, all forms | 30,286 | 35,712 | U.S.S.R. 25,090; Yugoslavia 6,123; Belgium-Luxembourg 4,499. |
| Magnesium metal including alloys, all forms | 952 | 973 | Mainly from U.S.S.R. |
| Manganese: | | | |
| Ore and concentrate [3] thousand tons | 388 | 441 | U.S.S.R. 335. |
| Oxide | 200 | NA | |
| Molybdenum metal including alloys, all forms | 2 | 2 | All from Austria. |
| Nickel: | | | |
| Ore and concentrate | -- | 430 | All from France. |
| Scrap | -- | 197 | Do. |
| Metal including alloys, unwrought and semimanufactures [3] | [4] 4,106 | 3,722 | U.S.S.R. 3,053; Cuba 300. |
| Platinum-group metals including alloys, all forms value, thousands | $214 | NA | |
| Silver including alloys do | r $2,551 | $4,343 | Belgium-Luxembourg $1,646; Netherlands $1,600. |
| Tin: | | | |
| Oxides long tons | 36 | 28 | All from West Germany. |
| Metal including alloys, all forms do | 698 | 628 | All from United Kingdom. |
| Titanium oxides | 726 | 696 | West Germany 521; United Kingdom 175. |
| Tungsten: | | | |
| Ore and concentrate | 97 | -- | |
| Metal and alloys, all forms | 2 | 2 | All from Austria. |

See footnotes at end of table.

Table 3.—Czechoslovakia: Imports of selected mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Zinc: | | | |
| Oxide | 150 | NA | |
| Dust (blue powder) | 2,838 | 2,249 | Yugoslavia 1,866; Belgium-Luxembourg 383. |
| Metal and alloys, all forms [4] | 56,019 | 56,445 | U.S.S.R. 33,085; Yugoslavia 14,518; Poland 8,842. |
| Other: | | | |
| Ore and concentrate | r 9,832 | 789 | Netherlands 506; Belgium-Luxembourg 200. |
| Oxides, hydroxides and peroxides of metals, n.e.s | 301 | NA | |
| Metals including alloys, all forms: | | | |
| Metalloids | 1,180 | 1,250 | All from Norway. |
| Base metals, including alloys [5] | r 398 | 676 | All from Poland. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Dust and powder of precious and semiprecious stones value, thousands | r $98 | $239 | Switzerland $147; Netherlands $92. |
| Grinding and polishing wheels and stones | r 315 | 341 | West Germany 135; Italy 133; United Kingdom 55. |
| Pumice, emery and other natural abrasives | 894 | 608 | Italy 538; United Kingdom 70. |
| Asbestos [3] | r 38,220 | 42,032 | U.S.S.R. 21,697; Botswana 11,107; Canada 1,827. |
| Barite | 1,456 | 830 | All from West Germany. |
| Cement [3] thousand tons | r 472 | 730 | U.S.S.R. 439; Romania 128; Hungary 64. |
| Clays and clay products: | | | |
| Crude clays | 1,391 | 1,586 | All from West Germany. |
| Products: | | | |
| Nonrefractory [3] | 4,478 | 16,668 | Hungary 9,120; Italy 5,478. |
| Refractory | 9,975 | 6,135 | West Germany 2,783; France 1,290; Italy 644. |
| Diamond: | | | |
| Gem value, thousands | $138 | $755 | United Kingdom $593; Belgium-Luxembourg $182. |
| Industrial do | r $1,684 | $1,520 | All from Belgium-Luxembourg. |
| Diatomite and other infusorial earth | 1,123 | 1,599 | All from Iceland. |
| Feldspar and fluorspar | 12,156 | 10,711 | Yugoslavia 5,394; West Germany 4,240; France 1,077. |
| Fertilizer materials: | | | |
| Crude, phosphatic thousand tons | 416 | NA | |
| Manufactured: | | | |
| Nitrogenous (N content) [3] do | 70 | 75 | U.S.S.R. 56. |
| Phosphatic ($P_2O_5$ content) [3] do | 365 | 359 | U.S.S.R. 179; Tunisia 73; Morocco 69. |
| Potassic ($K_2O$ equivalent) [3] do | 611 | 577 | East Germany 439; U.S.S.R. 137. |
| Other, including mixed do | 40 | NA | |
| Ammonia | 3,794 | 6,038 | All from West Germany. |
| Gem stones, precious and semiprecious, except diamond value, thousands | r $263 | $57 | All from France. |
| Graphite | 255 | 268 | West Germany 233; Italy 35. |
| Gypsum and plasters [3] | 28 | 28 | All from East Germany. |
| Lime [5] | 65,940 | 52,712 | All from Poland. |
| Magnesite | -- | 1,240 | All from Greece. |
| Mica, worked | r 2 | 6 | Austria 3; Switzerland 3. |
| Pigments, mineral, iron oxides | r 1,333 | 1,365 | All from West Germany. |
| Pyrite, sulfur content [3] thousand tons | 63 | 95 | U.S.S.R. 90. |
| Salt: | | | |
| Rock [5 8 9] | 845,006 | 804,114 | East Germany 694,500. |
| Brine [5 8] | 111,245 | 113,655 | U.S.S.R. 103,894. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda [5 8] | r 52,593 | 46,938 | West Germany 37,498; Romania 5,100; Poland 4,340. |
| Caustic potash | 307 | NA | |
| Soda ash [4 3] thousand tons | r 111 | 116 | East Germany 54; Romania 36; Poland 23. |

See footnotes at end of table.

Table 3.—Czechoslovakia: Imports of selected mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 5,654 | 3,453 | All from Yugoslavia. |
| Worked | 260 | NA | |
| Limestone and dolomite | 2,190 | 6,837 | All from Poland. |
| Gravel and crushed rock | r 2,552 | 2,020 | All from Austria. |
| Quartz and quartzite | 3,642 | 3,780 | All from West Germany. |
| Sand | 89 | -- | |
| Sulfur: | | | |
| Elemental all forms [3] thousand tons | r 325 | 322 | Poland 172; U.S.S.R. 147. |
| Sulfur dioxide | 310 | 320 | All from West Germany. |
| Sulfuric acid [3] thousand tons | r 81 | 75 | U.S.S.R. 63; Poland 11. |
| Other, unspecified crude nonmetals: | | | |
| Slag, dross, etc | 3,721 | 3,783 | All from Austria. |
| Crude, n.e.s | 1,456 | NA | |
| Oxides of strontium, barium and magnesium | 387 | 361 | France 221; West Germany 140. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black [4] | r 18,518 | 22,959 | U.S.S.R. 13,638; Romania 7,400. |
| Coal and briquets: | | | |
| Anthracite and bituminous coal [3] thousand tons | 5,535 | 5,299 | U.S.S.R. 2,669; Poland 2,630. |
| Lignite briquets [3] do | r 694 | 580 | All from East Germany. |
| Coke and semicoke [4] do | 70 | 21 | All from U.S.S.R. |
| Gas, natural [4] million cubic feet | 68,404 | 83,438 | Do. |
| Hydrogen, helium and rare gases | -- | 42 | All from West Germany. |
| Petroleum: | | | |
| Crude [3] thousand 42-gallon barrels | 92,897 | 104,137 | U.S.S.R. 95,888. |
| Refinery products: | | | |
| Gasoline do | 6 | 360 | Yugoslavia 266; West Germany 93. |
| Kerosine and jet fuel do | r 20 | 8 | All from Greece. |
| Distillate do | 10 | NA | |
| Lubricants [5] do | 367 | 335 | Austria 303. |
| Residual fuel oil [3] [10] do | 1,000 | 1,468 | Romania 1,310; West Germany 158. |
| Other: | | | |
| Liquefied petroleum gas do | 282 | 273 | All from Austria. |
| Mineral jelly and wax do | 4 | 4 | All from West Germany. |
| Petroleum coke do | 53 | 49 | Do. |
| Unspecified [8] do | r 114 | 43 | Poland 35; West Germany 7. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 7,700 | 9,428 | Austria 9,207. |

r Revised. NA Not available.
[1] Compiled from the Supplement to the World Trade Annual, 1972, Walker and Co., New York, 1974.
[2] Compiled from the World Trade Annual, 1973, Walker and Co., New York, 1975.
[3] Source: Official Czechoslovak Trade Statistics.
[4] Source: Official Trade Statistics for U.S.S.R.
[5] Source: Official Polish Trade Statistics.
[6] Erroneously reported as tons in the previous edition.
[7] Statistics of World Trade in Steel 1973, United Nations, New York, 1974.
[8] Source: Official Romanian Trade Statistics.
[9] Source: Official East German Trade Statistics.
[10] Source: Official Hungarian Trade Statistics.

## COMMODITY REVIEW

### METALS

**Aluminum.**—The production of aluminum in 1974 reached approximately 50,000 tons, showing an increase of 4.6% over that of 1973. Czechoslovakia imported 97,632 tons of aluminum from the U.S.S.R. in 1974 compared with 90,244 tons in 1973.

A new rolling mill for aluminum and aluminum alloys was put into operation on an experimental basis at Kovohute Bridlicna. The yearly foil output is to be 10,000 tons and the strip output, 26,000 tons.[5]

**Antimony.**—Czechoslovakia produced an estimated 1,400 tons of antimony which covered domestic demands. Existing facilities at Banska Dubrave, Pezinok, and Zlate

[5] Jedlicka Jaromir. A New Rolling and Heat-Treatment Works for Aluminum Strips and Foils. Neue Hütte (Leipzig), No. 8, August 1975, pp. 499–501.

Idce are to be further expanded. The reconstruction and modernization of the old metallurgical plant at Vajskove, where antimony is to be extracted from complex tetrahydride ores is still in progress.[6]

**Copper.**—In 1974, the approximate total consumption of copper was 51,200 tons, of which domestic production provided only 4,500 tons or 8.8%.[7] Copper ore production was 667,000 tons or 10,000 tons more than in 1973. By 1990, production of copper in concentrates is supposed to reach 8,600 tons. New beneficiation facilities will be built at Novoveska Huta, Slovinky, Fichtenbuhl, Zlate Hory, and Zlatno.[8]

**Iron Ore.**—During recent prospecting in Czechoslovakia no iron ore deposits of any significant size were discovered. Thus, Czechoslovak resources are now mostly limited to the deposits situated in the eastern part of the Slovak Ore Mountains (west of Kosice) where extraction will be concentrated in the future.[9]

In 1974, Czechoslovakian iron ore production provided only 6% of domestic needs. A total of 11,825,000 tons, or 85% of the iron ore imports, came from the U.S.S.R., mostly from the Krivoi Rog in the Ukraine. The rest of the ore was imported from India, Sweden, Brazil, and Algiers.[10]

An ore processing plant is being built in the Krivoi Rog region in order to improve the quality of the ore shipped. By 1980 this plant is expected to be fully operational and Czechoslovakia is to receive iron ore concentrates and pellets instead of crude ore and agglomerates. This should reduce the transportation costs, since a very large amount of rock is now included in the ore shipments.[11] The average iron content of the ore is reported to be only 58%.[12] Also the high silicon oxide content and the so-called acidity of this ore presently requires large quantities of coke and limestone in the smelting process. The future decrease in coke consumption per ton of steel produced will thus cut costs considerably.

The new Klement Gottwald plant at Kuncice (near Ostrava) is one of Czechoslovakia's largest industrial enterprises and, together with the East Slovak iron and steel works at Kosice, is to process most of the imported iron ore.

**Iron and Steel.**—The Czechoslovak steel industry is expanding on the basis of iron ore imported primarily from the U.S.S.R. and is expected to continue to expand for many years. Production of pig iron in 1974 increased by 364,000 tons (4.3%) and that of crude steel by 482,000 tons (3.7%) over 1973 production.

A major reconstruction and expansion is under way at the special steel plant located at Drin, a suburb of Kladno, Bohemia. Output of this plant is expected to triple by 1980. Here a 100-ton electric furnace, designed in the U.S.S.R., was under construction during 1974 in the newly erected electric steel plant which is part of the Poldi II metallurgical complex for the production of high-grade steel. This furnace is to be the largest in Czechoslovakia and is to go into operation at yearend 1975.[13] A second 100-ton furnace is also planned. This complex plans eventually to produce 420,000 tons per year of high-grade steel and has already cost an estimated 20 billion korunas, including reconstruction of the old works.[14]

A long range plan has been outlined for future additions to the new plant at Kladno. This is one of C.S.S.R.'s top priority projects. It is divided into four stages: A billet mill, a medium-light section mill, and the installation of two more 100-ton electric furnaces. Heavy metallurgical scrap iron, mainly supplied by other Czechoslovak plants, will be the basic material processed at the works. The startup of the billet mill is scheduled in 1977. The completion date of the whole project may run into 1990. After the construction is completed, the complex is supposed to produce 1.2 million tons of highgrade steel per year.[15]

A new iron foundry has been put into operation at the South Moravian fitting works in Hodonin. It has a capacity of 24,000 tons per year of castings and its total cost was 180 million korunas.

Czechoslovakia's pig iron and steel production by furnace type is listed in table 4.[16]

[6] Malcharek Jaroslov. Perspektivy Ceskoslovenskeho Rudneho a Nerudneho Hornictvi do Roku 1990 (Prospects of the Czechoslovak Metallic and Nonmetallic Ore Mining to 1990). Sbornik vedeckych praci Vysoke skoly banske v Ostrave (Trans. of the Ostrava Inst. of Min. and Met.), Ostrava, No. 1, 1974, p. 119.
[7] Page 117 of work cited in footnote 6.
[8] Work cited in footnote 6.
[9] Svet Hospodarstvi, No. 93, Aug. 2, 1974.
[10] Statisticka Rocenka Ceskoslovenske Socialisticke Republiky, 1975 (Statistical Annual of the Czechoslovak Socialist Republic, 1975). Prague, 1975, p. 444.
[11] Strida Michal. Tvorba, Mar. 27, 1974.
[12] Zemedelske Noviny, Oct. 21, 1974.
[13] Odborar, No. 18, September 1975.
[14] Technicky Tydenik, No. 14, Apr. 1, 1975.
[15] Odborar, No. 14, July 1975.
[16] Pages 278–279 of work cited in footnote 10.

Table 4.—Czechoslovakia: Salient statistics on iron and steel production

| | 1972 | 1973 | 1974 |
|---|---|---|---|
| PIG IRON | | | |
| Number of blast furnaces | 16 | 16 | 16 |
| Production of pig iron and ferroalloys: | | | |
| Pig iron for steelmaking ---- thousand metric tons | 7,918 | 8,118 | 8,411 |
| Pig iron for foundry ---- do | 414 | 389 | 460 |
| Blast furnace ferroalloys ---- do | 28 | 27 | 34 |
| Electric furnace ferroalloys ---- do | 116 | 122 | 127 |
| Total ---- do | 8,476 | 8,656 | 9,032 |
| Materials consumed per ton of pig iron: | | | |
| Iron ore and manganese ore ---- kilograms | 330 | 361 | 369 |
| Sinter ---- do | 1,585 | 1,506 | 1,525 |
| Scrap ---- do | 23 | 24 | 19 |
| Coke ---- do | 566 | 540 | 541 |
| Limestone ---- do | 120 | 89 | 70 |
| CRUDE STEEL | | | |
| Production of crude steel: | | | |
| Open hearth ---- thousand metric tons | 8,502 | 8,727 | 8,998 |
| Bessemer ---- do | 217 | 216 | 208 |
| Electric furnace ---- do | 1,492 | 1,495 | 1,534 |
| Oxygen converter ---- do | 2,516 | 2,720 | 2,900 |
| Total ---- do | 12,727 | 13,158 | 13,640 |
| Materials consumed per ton of crude steel: | | | |
| Pig iron ---- kilograms | 702 | 702 | 708 |
| Scrap ---- do | 412 | 395 | 402 |

**Lead and Zinc.**—Lead-zinc ore production in 1974 was 552,000 tons (34,000 tons less than in 1973). This ore is presently mined at deep levels in the old mines of Pribram and also at the Kutna Hora and Banska Stiavnica deposits. At Pribram new developments are under way at the Kvetne, Radeticich, and Milinsku mines.

Lead production is expected to increase from 3,896 tons in 1974 to 5,700 tons in 1980 and is to be kept at this level through 1990. Zinc production in 1980 is to be 12,100 tons per year. However, zinc output will decrease in the near future due to depletion of some deposits.[17]

**Mercury.**—Mercury is extracted from vein deposits at Rudnany (Slovakia). The newly built plant processes ores at a rate of 40 tons per day. The concentrate contains 2% mercury. Czechoslovakia's mercury production in 1974 decreased by 15% compared with that of 1973.

**Nickel.**—Present Czechoslovak nickel demand is approximately 4,500 tons per year and is shortly expected to reach 5,000 tons. Nickel metal imports totaled 4,534 tons in 1974, of which 4,092 tons came from the U.S.S.R. and 397 tons from Cuba.

Czechoslovakia's nickel is produced at the Sered nickel plant from imported iron nickel ores. The plant's capacity has been reported to be 2,000 tons per year of refined nickel.

Nickel ores are planned to be extracted in Josove in East Slovakia from 1985 to 1990.

**Tin and Tungsten.**—Tin and tungsten are mined together in the Cinovec and Horni Slavkov Districts. The tin-tungsten ore output from deposits is presently believed to be less than 200,000 tons per year; however, future output is expected to increase.

**Uranium.**—Czechoslovakia has substantial uranium deposits; however, since the end of World War II this uranium has been exclusively exported to the U.S.S.R. and the mining of the Jahymov and Pribram deposits is on the decline. The Jahymov deposit is nearly depleted. A new uranium appraisal of the C.S.S.R. was made in 1973 and showed a number of promising areas in addition to the known deposits. Uranium ore has been found in the Moldanubikum area, southern Czechoslovak proterozoic, granite massif, and the permotriassic of southern Karpathia.[18]

The uranium industry is expected to expand the course of the sixth 5-year plan (1976–80). Considerable expansion is planned at Pribram, Nove Mesto, and

[17] Work cited in footnote 6.

[18] Sorf, Frantisek. Prognoza dalsiho rozvoje vyhledavani a tezby uranovych rud v CSSR (The Forecast of Further Development of Prospecting and Mining of Uranium Ore in CSSR). Rudy (Prague), No. 11, v. 23, 1975, pp. 337–338.

Bystrice pod Pernstejnem. Construction of housing is anticipated in the new uranium districts of North Bohemia at Ceska Lipa, Liberec, and Steaz pod Ralskem. In the areas of developed mines (Dolni Rozinka, Western Bohemia, Pribram), mining is being performed at greater depths and will gradually diminish only to be compensated for by the new developments in the North Bohemian area.[19]

Estimated reserves of uranium metal in Czechoslovakia are approximately 25,000 tons (29,480 tons of $(U_3O_8)$ and the estimated production capability is 250 tons per year of $U_3O_8$.[20] This, however, is only a very rough estimate. Data on Czechoslovakia's uranium reserves is practically nonexistent due to the high secrecy imposed on the uranium industry.

## NONMETALS

**Asbestos.**—Czechoslovak participation in the development of an asbestos complex at the Kiembaev deposit in the southern Urals, U.S.S.R., continued throughout 1974. Czechoslovakia will deliver automatic dump trucks as well as other engineering products to the U.S.S.R. in the period 1974–76 and will in return receive deliveries of asbestos between 1980 and 1991.[21]

In 1974, Czechoslovakia imported a total of 38,826 tons of asbestos, of which 28,488 tons came from the U.S.S.R.[22]

**Cement.**—Czechoslovakia hopes to achieve near self-sufficiency in cement as soon as its three new major cement plants come into full operation. It was reported, however, that construction of these plants is behind schedule. A cement plant with a capacity of 600,000 tons per year is being built near the Klement Gottwald Works at Kunice near Ostrava. Production is planned to start in the first quarter of 1975. The plant is to use the waste product from the Gottwald Works (65% limestone and 35% blast furnace slag).[23]

The Zahorie Lime Works and Cement Plant at Rohoznik in West Slovakia is expected to go into production in December 1975.[24] The Turna nad Badvou cement plant, with a capacity of 770,000 tons per year of cement, is to be the country's largest when it goes into full operation.

**Clays.**—*Kaolin.*—With the production of 484,000 tons in 1974, Czechoslovakia has become the sixth most important producer of kaolin in the world. The kaolin industry is maintaining a steady growth and, in addition to supplying all indigenous requirements, it exports 297,000 tons. In 1974, major exports were 88,000 tons to West Germany, 44,000 tons to Poland, 30,000 tons to Austria, 25,000 tons to Yugoslavia, and 10,000 tons to East Germany.[25]

The new flotation plant at Kaznejov near Plzen was completed in the last quarter of 1974 and now produces 200,000 tons of raw material for the paper and rubber industries. This plant is now the largest of its kind in Europe and the deposits of kaolin in the nearby quarry are reported sufficient to last 100 years.[26]

**Feldspar.**—Large deposits of feldspar were discovered near the village of Halamky, in the Jindrichuv Hradec area, where the reserves are estimated at a minimum of 60 million cubic meters. The Czechoslovak Ceramic Works is in the process of building a new modern plant at this location for feldspar extraction and plans trial operation at yearend 1975. Thus, under the sixth 5-year plan, Czechoslovakia will no longer have to import feldspar and even may be in a position to export it.[27]

**Fertilizer Materials.**—The production of nitrogen fertilizers in 1974 increased by 9.9% with the help of the urea facilities at Sala nad Vahom and Zaluzi. Sala nad Vahom is the principal nitrogen fertilizer complex in Czechoslovakia with a 432,000-ton-per-year ammonia production. Zaluzi is the second most important plant and hopes to achieve planned production of urea towards yearend 1975.

Once the plants, which are still under construction, go into operation, Czechoslovakia will become self-sufficient and even export nitrogen fertilizers (especially urea).

The production of the phosphatic fertilizers ($P_2O_5$ content) for 1974 was 336,000 tons, showing a slight decrease from that of 1973 and meeting only half of the nation's requirements.

**Magnesite.**—In 1974, magnesite production reached 634,000 tons. Total exports were reported as 400,000 tons, a 100% increase over those of 1973. Exports were

[19] Hornik a Energetik. Uranium Yesterday, Today, and Tomorrow. No. 47, Nov. 20, 1975.
[20] Analysis of Energy Resources and Programs of the Soviet Union and Eastern Europe. Tech. Rpt. RADC–TR–74–204, December 1973, pp. 57–77.
[21] Zahranicni Obchod, No. 11, November 1974.
[22] Work cited in footnote 10.
[23] Rude Pravo, No. 259, Nov. 3, 1975, p. 3.
[24] Rude Pravo, July 21, 1975, p. 3.
[25] Page 449 of work cited in footnote 10.
[26] Czechoslovak Heavy Industry (Prague), No. 7, July 1975, p. 27.
[27] Work cited in footnote 23.

93,000 tons to West Germany; 44,000 tons to East Germany; 72,000 tons to Hungary; 64,000 to Poland; and 37,000 to Romania.[28]

Czechoslovakia has spent 2.5 billion korunas in the development of the magnesite industry during the years 1956–75. It is expanding the capacity at Kosice, Podrecany, Lubenik, Burde-Poproci, and especially at the large Mikova mine near Jelsava.[29]

**Sulfur.**—Production of sulfur is far below demand and thus sulfur continued to be imported. In 1974, Czechoslovakia imported 196,000 tons of sulfur from Poland and 133,000 tons from the U.S.S.R.

Czechoslovakia produced 296,000 tons of pyrite, with a total sulfur content of 124,000 tons, showing an increase of only 1.6% over that of 1973.

The country is making an attempt to increase its sulfuric acid capacity in the forthcoming 5-year plan by the construction of two new sulfuric acid plants. The Neratovice plant (300,000-ton-per-year capacity) is presently under construction and is scheduled to go into operation in mid-1975. A contract for a new plant at Bratislava (330,000-ton-per-year capacity) was signed in November. Both plants are under contract with Polimex-Cekop Ltd., the Polish chemical engineering foreign trade organization.[30]

## MINERAL FUELS

Czechoslovakia's total primary energy consumption for 1974 was estimated at 105 million tons of standard coal equivalent as summarized in table 5. This represents an increase in total energy consumption of 2% over 1973 consumption. Coal now provides 73.0% of the total primary energy while oil represents 20.7%; natural gas 5.3%; hydroelectric power 0.4%; nuclear power 0.1%; and imported electric power 0.6%.

The share of the natural gas component in the total energy balance is expected to increase to 11% by 1980 and to 15% by 1990.[31] Deliveries of natural gas from the U.S.S.R. will continue to increase to meet Czechoslovak requirements in the future. Czechoslovakia is planning a transition from coal gas to natural gas in Slovakia by 1980, in Prague by 1990, and throughout Czechoslovakia by the year 2000.[32]

Table 5.—Czechoslovakia: Primary energy balance 1973–74
(Million tons of standard fuel equivalent) [1]

| Kind | Total primary energy | | Coal and coke | | Crude oil petroleum products | | Natural and associated gas | | Hydroelectric power | | Nuclear power | | Imported electric power | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1973 | 1974 | 1973 | 1974 | 1973 | 1974 | 1973 | 1974 | 1973 | 1974 | 1973 | 1974 | 1973 [2] | 1974 [2] |
| Production [3] | 79.1 | 79.6 | 76.9 | 77.6 | 0.3 | 0.2 | 1.4 | 1.3 | 0.4 | 0.4 | 0.1 | 0.1 | -- | -- |
| Exports | 6.1 | 6.4 | 5.9 | 6.2 | -- | -- | -- | -- | -- | -- | -- | -- | 0.2 | 0.2 |
| Imports | 29.9 | 31.8 | 5.3 | 5.2 | 20.8 | 21.5 | 3.1 | 4.3 | -- | -- | -- | -- | .7 | .8 |
| Apparent consumption | 102.9 | 105.0 | 76.3 | 76.6 | 21.1 | 21.7 | 4.5 | 5.6 | .4 | .4 | .1 | .1 | .5 | .6 |

[1] Conversion factors used are hard coal, 1.0; lignite and brown coal, 0.6; crude oil, 1.47; natural gas, 1.33; hydroelectric and nuclear power, 0.125.
[2] United Nations, New York. Annual Bulletin of Electric Energy Statistics for Europe, 1975, p. 18.
[3] See production table.

Source: World Energy Supplies, Statistical Papers, Series J, No. 18, (United Nations) N.Y., 1975.

Nuclear power is to contribute an increasing share of the energy supply in the future. However, it still remains fairly insignificant compared with total energy production. Three nuclear powerplants are scheduled for full operation by 1980 with a total capacity of 2,600 megawatts.

**Coal.**—In 1974, production of coal and lignite reached 110.7 million tons, or 1.2 million tons (1%) higher than in 1973. Total coal production has been maintained between 109.5 million and 113.5 million tons for the past 5-years. Bituminous coal production for the same period remained

[28] Page 450 of work cited in footnote 10.
[29] Rudy (Prague). V. 23, No. 5, 1975, pp. 117–122.
[30] Sulphur (London), No. 116, January–February 1975. p. 14.
[31] Svet Hospodarstva, Aug. 13, 1974.
[32] Technicke Noviny, Jan. 29, 1974.

steady at approximately 28 million tons per year. The gross output of brown coal and lignite averaged at approximately 78 million and 3.7 million tons per year, respectively. The production of bituminous, brown coal, and lignite by major basins is shown in table 6.[33]

Table 6.—Czechoslovakia: Production of coal by major basins
(Thousand metric tons)

| Basin | 1972 | 1973 | 1974 |
|---|---|---|---|
| Bituminous coal: | | | |
| Ostrava-Karvina | 23,793 | 23,761 | 24,094 |
| Kladno | 2,346 | 2,302 | 2,272 |
| Plzen | 452 | 430 | 397 |
| Trutnov | 716 | 713 | 710 |
| Rosice | 515 | 463 | 418 |
| Total | 27,822 | 27,669 | 27,891 |
| Brown coal: | | | |
| North Bohemia | 58,297 | 56,389 | 57,078 |
| Sokolov | 19,748 | 18,116 | 18,190 |
| Handlova | 2,908 | 2,982 | 3,064 |
| Modry Kamen | 773 | 750 | 839 |
| Total | 81,726 | 78,237 | 79,171 |
| Lignite: | | | |
| Bohemian lignite mines | 195 | 41 | -- |
| South Moravian lignite mines | 1,967 | 2,000 | 2,064 |
| Novaky coal mines | 1,678 | 1,551 | 1,555 |
| Total | 3,840 | 3,592 | 3,619 |
| Grand total | 113,388 | 109,498 | 110,681 |

Czechoslovakia presently imports approximately 5 million tons of bituminous coal from Poland and the U.S.S.R. (2,421,000 and 2,747,000 tons in 1974, respectively). These figures are representative of the coal imports for the past 5 years. In turn, Czechoslovakia exported a total of 3,717,000 tons of bituminous coal; 1,391,000 tons of brown coal; and 2,519,000 tons of coke distributed as follows: [34]

| | Thousand tons | Percent |
|---|---|---|
| Bituminous coal: | | |
| Austria | 717 | 19 |
| Germany, East | 710 | 19 |
| Romania | 632 | 17 |
| Hungary | 576 | 15 |
| Other | 1,082 | 30 |
| Total | 3,717 | 100 |
| Brown coal: | | |
| Germany, West | 1,343 | 97 |
| Austria | 14 | 1 |
| Other | 34 | 2 |
| Total | 1,391 | 100 |
| Coke: | | |
| Germany, East | 801 | 32 |
| Romania | 472 | 19 |
| Hungary | 285 | 11 |
| Other | 961 | 38 |
| Total | 2,519 | 100 |

Czechoslovakia's hard-coal reserves are estimated at 11,600 million tons and the brown-coal reserves at 12,500 million tons (Dec. 31, 1966). Coking coal accounted for 10.5% of the aggregate reserves of the hard coals.[35]

According to Zemedelske Noviny[36] taking increased future demands into account, deposits of hard coal will be depleted in about 70 years, those of lignite in 30 years, and those of brown coal in 50 years. In the future, coal will become increasingly expensive due to the deteriorating conditions under which it will have to be mined both in the Ostrava hard-coal basin and in the North Bohemian brown-coal basin where surface mining at greater depths will require expensive machinery, the shifting of railroad tracks, roads, and even the development of entire towns. In order to alleviate the burden placed upon its own resources, Czechoslovakia plans to import additional coal in the future, probably from Poland.

Czechoslovakia's total consumption of bituminous and brown coal listed by consumer groups in 1973 and 1974 is presented in table 7.[37]

[33] Pages 276–277 of work cited in footnote 10.
[34] Page 449 of work cited in footnote 10.
[35] United Nations Report, E. AD (XI)/R.4, Add. 12, Jan. 30, 1974.
[36] Zemedelske Noviny. July 16, 1974.
[37] Page 268 of work cited in footnote 10.

Table 7.—Czechoslovakia: Consumption of coal by type of consumer
(Percent)

| Consumer | Bituminous coal | | Brown coal | |
|---|---|---|---|---|
| | 1973 | 1974 | 1973 | 1974 |
| Electric powerplants | 20.6 | 19.7 | 46.3 | 46.2 |
| Steam for heating and industrial use | 19.2 | 19.1 | 25.3 | 26.3 |
| Coke plants | 48.5 | 51.1 | -- | -- |
| Coal gas plants | -- | -- | 3.5 | 3.7 |
| Railroads | 2.6 | 2.0 | 1.4 | 1.3 |
| Households | 3.2 | 2.8 | 9.1 | 9.2 |
| Other | 5.9 | 5.3 | 14.4 | 13.3 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |

According to Czechoslovak sources total consumption of coal and lignite may reach 140 million tons by 1980. The increased requirement for solid fuels will place the greatest demand upon the North Bohemian brown-coal basin. Output from this basin is planned to increase steadily during the sixth 5-year plan. The demand on the Ostrava-Karvina coal, suitable for coking, is to exceed 18 million tons in all years of the coming 5-year plan. The production of coke is to exceed 11 million tons per year.[38]

The development of a new coal mine in the foothills of the Krkonose mountains in the area of the East Bohemian coal mines was started in 1974 and is to produce 500,000 tons of hard coal per year. The first stage of the mine is to go into operation in 1978. Final development is to be completed in 1985 at a total cost of 664 million korunas.[39]

**Natural Gas.**—Production of natural gas in 1974 was estimated at approximately 1 billion cubic meters. The delivery of natural gas from the U.S.S.R. in 1974 reached 3.2 billion cubic meters, 39% over the 2.3 billion cubic meters imported in 1973.[40] Future gas deliveries are planned on an increasing basis.

Work is continuing on the second branch of the transit gas pipeline "Transgaz" representing 1,000 kilometers of a new gas pipeline in Czechoslovakia. At present, Transgaz transfers 12.5 billion cubic meters of Soviet natural gas to Western Europe and is to transfer 16.5 billion cubic meters after completion of more compressor stations. Discussions have been conducted with the U.S.S.R. in order to raise the pipeline capacity to 37 billion cubic meters. Czechoslovakia is to receive 10% of the amount of gas that is transported through this pipeline as payment for its construction.[41]

An agreement was signed in June 1974 as to Czechoslovakia's participation in the capital investment and construction of the Orenburg gas pipeline which runs from Orenburg in the southern Urals to the western borders of the U.S.S.R., and which will be used to deliver natural gas to Eastern European countries. About 6,000 Czechoslovakian workers are to be employed in the completion of a 560 kilometer section of the pipeline equipped with 5 compressor stations which is to be operational by the first of October 1979.[42] In return for investment in this project Czechoslovakia will receive 2.8 billion cubic meters of natural gas per year for a period of 12 years.[43]

**Petroleum.**—Czechoslovakia produced 149,000 tons of crude oil in 1974, a 13% decrease compared with 1973 production. This production represents only 1% of the present domestic petroleum consumption. For 1974, total crude imports were 14,655,000 tons of which 14,291,000 tons came from the U.S.S.R.[44] This shows a total increase in imports of 3.4% compared with 1973 imports.

In order to increase processing of Soviet crude oil, construction has been accelerated at the Zaluzi petrochemical plant at Most and the Slovnaft chemical combine near Bratislava. Czechoslovakia presently has a total refining capacity of about 19 million tons per year of which the Slovnaft and

[38] Bystricky, Karel. Role of Coal in Fuel-Power Basis in the Sixth 5-Year Plan. Uhli (Prague), No. 11, November 1974, pp. 442–445.
[39] Czechoslovak Heavy Industry (Prague), No. 2, 1975, p. 31.
[40] Vneshnyaya torgovla S.S.S.R. za 1974 (U.S.S.R. Foreign Trade for 1974) Moscow, 1975, p 207.
[41] Szyndzielorz, Karel. Transgaz for 37 Billion. Polityka (Warsaw), May 3, 1975, p. 13.
[42] Hornik a Energetik, No. 42, Oct. 17, 1974.
[43] Zemedelske Noviny (Prague), Sept. 25, 1975, p. 1.
[44] Page 445 of work cited in footnote 10.

Zaluzi plants are processing 9 million and 3 million tons per year respectively; they hope to reach 11 million and 5.5 million tons per year, respectively, by the end of the current 5-year plan. Slovnaft supplies about 50% of all propellants, lubricants, and heating oils for the national economy. However, certain construction delays have occurred at Slovnaft and the ethylene plant and the plants for production of ethyl oxide and glycols are behind schedule.[45]

The newly built refinery at Kralupy, located 20 kilometers from Prague, was scheduled to be completed by yearend 1974. The refinery will be using imported Soviet crude oil from the "Druzba" (Friendship) pipeline which links East European countries with the U.S.S.R. The refinery was to produce approximately 3 million tons of petroleum products per year and was to meet the demands of Prague and the surrounding district of Central Bohemia.

The fourth major refinery in Czechoslovakia is to be located between Ostrava and Opava in north Moravia. Construction was to begin in 1975. The capacity of this refinery was to be 3 million tons per year starting in 1978 and 6 million tons per year in 1980.

Czechoslovakia was to participate in the construction of the Adriatic pipeline which extends from the island of Krk, off the coast of Yugoslavia, through Hungary to Bratislava. Crude oil is to be delivered at Krk from Middle Eastern and African countries. By 1980, a total of 34 million tons of crude oil per year is expected to flow through the pipeline, 5 million tons of which is to be delivered to Czechoslovakia, which was to contribute approximately a total of $25 million plus technology and equipment to this project.

In February 1974, Czechoslovakia signed an agreement with Libya to receive between 500,000 to 1 million tons of crude oil per year for the next 10 years in exchange for Czechoslovak machinery and equipment. Similar agreements have been made in recent years with a number of countries in the Middle East and Africa (Egypt, Iraq, Iran, Algeria, Nigeria).

Nuclear Energy.—Czechoslovakia's first nuclear electric powerplant at Jaslovske Bohunice in Western Slovakia was put into operation in 1972, after being under construction for 10 years. This powerplant has a capacity of 840 megawatts and uses a heavy-water reactor where natural uranium is used as a fuel.[46]

Two more nuclear powerplants are to be put into operation in the sixth 5-year plan with the help of the U.S.S.R. Construction of the V–1 powerplant at Jaslovske Bohunice began in 1973 and continued into 1974. Installation of equipment is scheduled to begin in 1975 and initial startup was to be in 1977. Preparatory work began in 1974 on the V–2 powerplant at Dukovany. Both of these powerplants will use two of the Voronez type VVER–440 light-water reactors, each having a capacity of 440 megawatts, thereby providing each powerplant with a capacity of 880 megawatts. They are both to be put into operation gradually from 1977 to 1980 and are the first integrated type of nuclear powerplants which are being built by all the COMECON[47] countries in Europe.[48]

Plans are being made for the fourth Czechoslovak powerplant to be located at Mochovce in the Levice District. This plant will be designated V–3 and again was to use two VVER–440 reactors, giving a total capacity of 880 megawatts. The estimated cost of this plant is 5.5 billion korunas and startup of the two stages is set for 1981 and 1982.

An agreement has also been made with the U.S.S.R. for increasing the future total capacity of nuclear powerplants to 5,000 megawatts by the year 1985.[49]

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[45] Rude Pravo, Feb. 14, 1974, p. 2.
[46] Goldschmidt, Jan. First Czechoslovak Nuclear Powerplant Reviewed. Energetika, No. 7, July 1974, pp. 273–276.
[47] COMECON (CMEA) Council of Mutual Economic Assistance comprising the following countries: Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the U.S.S.R.
[48] Neumann, Jan. 1975 Czechoslovak Nuclear Power Program. Jaderna Energie, No. 1, 1975, pp. 1–2.
[49] Neumann, J. Die Entwicklung der Kernenergetick in der C.S.S.R. (Development of Nuclear Energy in the C.S.S.R.) Kernenergie, v. 18, No. 4, 1975, pp. 93–99.

# The Mineral Industry of Egypt

By Daniel C. Adkins [1]

Egypt's mineral activities were dominated by the petroleum and natural gas industry. The national budget allocated up to $245 million [2] for this industry, compared with $120 million for nonpetroleum mineral activities.[3] The Government-devised production-sharing system for oil exploration met with continued success. Concession areas were equivalent to 18% of total Egyptian land area by the end of 1974. Two new oilfields were brought into production, and two gasfields and their associated energy and petrochemical projects neared operation. It was planned to use the new oil and gas supplies for fertilizers, energy, petrochemicals, and the direct reduction of iron ore. Construction of the dual 42-inch crude oil pipeline from the Gulf of Suez to the Mediterranean Sea (SUMED) was well underway and received 70% of Egypt's oil budget.

## PRODUCTION

Crude oil production fell 8.6% to an annual average of 147,060 barrels per day even though the July and Ramadan oilfields were brought into production. The decline was attributed to a fall of reservoir pressure in the El Morgan Field in the Gulf of Suez and production setbacks due to the October 1973 war and resulting embargo. Israel continued producing about 90,000 barrels per day from occupied Egyptian oilfields on the Sinai Peninsula. Egypt's first gasfield, the Abu Madi in the Nile Delta north of Cairo, entered full production and piped over 100 million cubic feet per day of gas to industrial consumers in the Cairo area.

[1] Physical scientist, Division of Petroleum and Natural Gas.

[2] Where necessary, values have been converted from Arab Republic of Egypt pounds (£E) to U.S. dollars at the rate of £E1.00=US$2.56.

[3] Federation of Egyptian Industries (Cairo, Egypt). Yearbook for 1974. Pp. 31–33.

## Table 1.—Egypt: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **METALS** | | | |
| Chromite | 812 | 485 | e 500 |
| Iron and steel: | | | |
| Iron ore and concentrate thousand tons | 427 | 656 | 1,302 |
| Pig iron do | r 500 | r e 400 | e 450 |
| Crude steel do | 22( | r e 260 | e 270 |
| Manganese ore and concentrate | 2,409 | 2,686 | 4,947 |
| **NONMETALS** | | | |
| Asbestos | 441 | 329 | 222 |
| Barite | 1,704 | 1,890 | 274 |
| Cement, hydraulic thousand tons | 3,822 | 3,617 | 3,156 |
| Clays: | | | |
| Fire do | r 896 | 900 | 950 |
| Kaolin | 24,626 | 30,305 | 25,840 |
| Diatomite | 1,668 | 1,600 | 1,600 |
| Feldspar, crude | 3,234 | 3,033 | 2,228 |
| Fertilizer materials: | | | |
| Crude phosphate rock thousand tons | 563 | 553 | 507 |
| Manufactured: | | | |
| Nitrogenous (N content) do | 90 | 66 | e 60 |
| Phosphatic: | | | |
| Thomas slag do | 44 | 38 | NA |
| Superphosphate do | 518 | 419 | NA |
| Fluorspar | 898 | 1,509 | e 1,600 |
| Gypsum and anhydrite, crude thousand tons | r 427 | 524 | 559 |
| Mica | -- | -- | 98 |
| Pumice | 250 | 250 | 250 |
| Salt, marine thousand tons | r 383 | 454 | 498 |
| Sodium sulfate, natural | 2,000 | 2,000 | NA |
| Stone, sand and gravel: | | | |
| Basalt thousand cubic meters | r 198 | 388 | 337 |
| Dolomite thousand tons | 88 | 90 | NA |
| Granite: | | | |
| Broken do | 15 | 20 | NA |
| Dimension cubic meters | 450 | 400 | 500 |
| Gravel thousand cubic meters | r 1,090 | 1,600 | 1,300 |
| Limestone and other calcareous, n.e.s do | 4,793 | 5,200 | 5,300 |
| Marble: | | | |
| Blocks (including alabaster) cubic meters | 7,380 | 7,400 | 8,000 |
| Broken and gravel | 6,170 | 5,300 | NA |
| Quartz | 13,690 | 12,713 | NA |
| Sand, including glass sand thousand cubic meters | 2,869 | 3,065 | NA |
| Sandstone do | 93 | 102 | 110 |
| Stone, n.e.s do | 146 | 150 | NA |
| Sulfur, elemental byproduct | e 1,000 | e 1,000 | 2,755 |
| Talc, soapstone, steatite, and pyrophyllite | 7,727 | 7,036 | 3,942 |
| Vermiculite | -- | 22 | 61 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Coke: | | | |
| Oven and beehive thousand tons | r 354 | r e 360 | e 360 |
| Gashouse and other low temperature e do | 30 | 30 | 30 |
| Total e do | r 384 | 390 | 390 |
| Gas, natural: | | | |
| Gross production million cubic feet | e 25,000 | 30,700 | 49,600 |
| Marketed e do | 2,500 | 3,100 | 15,000 |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | r 74,279 | 58,751 | 53,677 |
| Refinery products: | | | |
| Gasoline and naphtha do | r 6,872 | 7,688 | 10,090 |
| Kerosine and jet fuel do | r 7,564 | 8,975 | 10,400 |
| Distillate fuel oil do | r 7,982 | 8,945 | 10,720 |
| Residual fuel oil do | r 21,392 | 20,313 | 18,988 |
| Other: | | | |
| Liquefied petroleum gas do | r 209 | 499 | 708 |
| Asphalt do | r 685 | 867 | 406 |
| Unspecified do | 119 | 483 | 308 |
| Refinery fuel and losses do | r 1,997 | 1,787 | 1,746 |
| Total do | 46,820 | 49,557 | 53,366 |

e Estimate. p Preliminary. r Revised. NA Not available.

## TRADE

In early 1974, Egypt and the United States resumed diplomatic relations, which had been unilaterally severed by Egypt following the Arab-Israeli War of 1967. Although United States-Egyptian trade was not hampered during this period, closer diplomatic relations should open Egypt for more U.S. trade and investment.

Work started in April 1974 to reopen the Suez Canal, closed since 1967. By yearend, teams from the United States, the United Kingdom, France, Egypt, and the Soviet Union had cleared mines and other ordnance from the canal and surrounding areas. The Murphy Pacific Marine Salvage Co. of California was employed to remove the 10 wrecks that blocked the Suez Canal and completed its operation by yearend. The remaining work includes dredging and rebuilding canal support facilities.

The Egyptian Government plans to increase the capacity of the canal in two stages to accommodate 150,000- and then 250,000-deadweight-ton vessels. These plans would necessitate considerable financing and require up to 8 years for completion. The expansion project would allow the canal to increase its share of seaborne trade from an estimated 4% to 24% of total world seaborne trade.

Table 2.—Egypt: Exports and reexports of mineral commodities [1]
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum including alloys, semimanufactures | | 244 | -- |
| Copper including alloys, semimanufactures | | -- | 100 |
| Iron and steel: | | | |
| Pig iron, sponge iron, powder | | 4,658 | 2,183 |
| Primary forms | | 131 | 5,485 |
| Semimanufactures | | 84,773 | 50,985 |
| Lead including alloys, semimanufactures | | 4 | -- |
| Other, ash and residue-bearing nonferrous metals, n.e.s | | 74 | 157 |
| NONMETALS | | | |
| Cement | | 799,022 | 564,321 |
| Clay products: | | | |
| Refractory, including nonclay brick | | 32 | 326 |
| Nonrefractory | | 864 | 1,279 |
| Diamond, industrial | carats | 648 | 15 |
| Fertilizer materials: | | | |
| Crude, phosphatic | | 52,517 | -- |
| Manufactured, phosphatic, Thomas slag | | 117,247 | 59,495 |
| Gypsum and plasters | | 553 | 315 |
| Lime | | 4,341 | 8,184 |
| Pigments, mineral, natural crude | | -- | 153,201 |
| Salt | | 16,233 | 80,771 |
| Stone, sand and gravel: | | | |
| Dimension stone, crude and worked | | 64 | 196 |
| Gravel and crushed rock | | 98 | -- |
| Sulfuric acid | | 479 | 1,527 |
| Talc, steatite | | 311 | 749 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | | 765 | -- |
| Coke and semicoke of coal, lignite or peat | | 22,117 | 37,278 |
| Petroleum: | | | |
| Crude | thousand 42-gallon barrels | 36,203 | 67,082 |
| Partly refined | do | 356 | -- |
| Refinery products: | | | |
| Distillate fuel oil | do | 1,957 | 1,264 |
| Residual fuel oil | do | (2) | -- |
| Other, nonlubricating oils, n.e.s | do | 837 | 3,153 |
| Total | do | 2,794 | 4,417 |
| Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals | | -- | 370 |

[1] From the Central Agency for Public Mobilisation and Statistics, October 1973 and November 1974.
[2] Less than ½ unit.

## Table 3.—Egypt: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum: | | |
| Oxide and hydroxide | 106 | 157 |
| Metal: | | |
| Scrap | 8,463 | 4,591 |
| Unwrought and semimanufactures | 1,540 | 2,173 |
| Arsenic trioxide, pentoxide, acid | (2) | (2) |
| Chromium, oxides and hydroxides | 61 | 33 |
| Cobalt, oxides and hydroxides | 2 | (2) |
| Copper: | | |
| Matte | 137 | -- |
| Metal including alloys, all forms | 749 | 1,253 |
| Gold ---- troy ounces | 28,614 | 225 |
| Iron and steel: | | |
| Metal: | | |
| Scrap | 66,287 | 44,140 |
| Sponge iron, powder and shot | 193 | 27 |
| Spiegeleisen | 96,317 | 45,360 |
| Ferromanganese | 3,208 | 3,106 |
| Steel, primary forms | 93,879 | 108,073 |
| Semimanufactures | 242,909 | 176,641 |
| Lead: | | |
| Oxides | 951 | 236 |
| Metal, including alloys, all forms | 8,737 | 6,219 |
| Manganese oxides | 1,579 | 1,421 |
| Mercury ---- 76-pounds flasks | 470 | 218 |
| Molybdenum metal, including alloys, all forms | 3 | (2) |
| Nickel: | | |
| Matte, speiss and similar materials | 3 | 50 |
| Metal, including alloys, all forms | 10 | 7 |
| Rare-earth metals, compounds thereof, not further described | 4 | 11 |
| Silver metal including alloys, all forms ---- troy ounces | 57,839 | 446,155 |
| Tin: | | |
| Oxide ---- long tons | 6 | 5 |
| Metal including alloys, all forms ---- do | 139 | 156 |
| Titanium oxides | 593 | 778 |
| Tungsten ore and concentrate, gross weight | 1 | (2) |
| Uranium and thorium, including alloys | 48 | 17 |
| Zinc: | | |
| Oxides | 444 | 314 |
| Metal including alloys, all forms | 1,396 | 2,929 |
| Other: | | |
| Ore and concentrate, n.e.s | 3,762 | 1,916 |
| Metal including alloys, all forms: | | |
| Pyrophoric alloys, including ferrocerium | (2) | -- |
| Base metals including alloys, all forms, n.e.s | 1 | (2) |
| **NONMETALS** | | |
| Abrasives: | | |
| Natural, n.e.s | 223 | 56 |
| Grinding and polishing wheels and stones | -- | 354 |
| Asbestos | 8,787 | 697 |
| Boron materials, oxide and acid | 541 | 4 |
| Cement | 1,830 | 1,667 |
| Chalk | 339 | 2 |
| Clays and clay products, including refractory brick: | | |
| Crude clays, n.e.s | 5,372 | 5,305 |
| Products: | | |
| Refractory, including nonclay brick | 12,453 | 7,923 |
| Nonrefractory | 131 | 2 |
| Diatomite | 531 | 1,226 |
| Feldspar and fluorspar | 58 | 1,560 |
| Fertilizer materials: | | |
| Crude: | | |
| Nitrogenous | -- | 5 |
| Potassic | 632 | 1 |
| Manufactured: | | |
| Nitrogenous | 273,639 | 404,456 |
| Other, including mixed | 2 | 89 |
| Ammonia | 67 | 2 |
| Graphite, natural | 155 | 152 |
| Gypsum and plasters | 201 | -- |
| Magnesite | 2,363 | 3,307 |
| Mica, including worked | 8 | 48 |
| Pigments, mineral, natural and crude | 967 | 950 |
| Pyrite, unroasted | 18,652 | 30,915 |

See footnotes at end of table.

Table 3.—Egypt: Imports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| NONMETALS—Continued | | |
| Salt | 16 | 4 |
| Sodium and potassium compounds, n.e.s: | | |
| Caustic soda | 48,507 | 45,697 |
| Caustic potash, peroxides of potassium and sodium, n.e.s | 574 | 437 |
| Stone, sand and gravel: | | |
| Dimension stone, crude and worked | 30 | 803 |
| Dolomite | -- | 251 |
| Quartz and quartzite | 8 | 2 |
| Sand, excluding metal-bearing | 2,097 | 1,603 |
| Sulfur: | | |
| Elemental | 62,954 | 23,158 |
| Sulfuric acid | 1 | 1 |
| Talc, steatite, natural | 67 | 13 |
| Other nonmetals, n.e.s: | | |
| Crude, n.e.s | 141 | 373 |
| Oxides, hydroxides and peroxides of barium and strontium | 500 | 18 |
| Bromine, fluorine, iodine | 6 | 20 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Asphalt and bitumen, natural | 22,572 | 10,360 |
| Coal and briquets: | | |
| Anthracite and bituminous coal | 28,740 | 24,502 |
| Briquets of anthracite and bituminous coal | 41 | -- |
| Hydrogen, helium and rare gases | 24 | 8 |
| Peat, including peat briquets and litter | 156 | 1,996 |
| Petroleum: | | |
| Crude and partly refined thousand 42-gallon barrels | 10,047 | 3,141 |
| Refinery products: | | |
| Gasoline do | (2) | (2) |
| Kerosine and jet fuel do | 2,277 | 832 |
| Distillate fuel oil do | 2,460 | 130 |
| Residual fuel oil do | 806 | 314 |
| Lubricants do | 4 | 5 |
| Other: | | |
| Liquefied petroleum gas do | 1,661 | 871 |
| Not specified do | 38 | 34 |
| Total do | 7,246 | 2,186 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 186 | 88 |

[1] From the Central Agency for Public Mobilisation and Statistics, October 1973 and November 1974.
[2] Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Aluminum.**—As construction of the Naj Hammadi aluminum smelter neared completion, plans were made to increase its capacity from 100,000 to 170,000 tons annually with further Soviet aid. Initial production of 100,000 tons per year may start in early 1975 if delays in construction of support facilities are overcome. Output will include cylinders, slabs, and wire rods, the majority of which will be exported. The smelter's electricity will be supplied by the Aswan High Dam.

**Copper.**—Negotiations between the Egyptian Metallurgical Industries Organization and the Zambian Government were initiated on the possibility of constructing a $50 million copper plant in Alexandria's "free zone." The plant would be able to produce 50,000 tons yearly of copper from ore shipped from Zambia.

**Gold.**—The Egyptian Geological Research Authority has begun studies to reopen the Eastern Desert gold mines in light of the increase in gold prices.

**Iron and Steel.**—In August 1974 the third blast furnace at the Hulwan iron and steel complex was inaugurated, raising Egyptian pig iron capacity from 300,000 to 900,000 tons per year. Corresponding steelmaking capacity was also installed, including oxygen steel converters, continuous-pouring units, a limestone unit, and an oxygen unit. Construction was initated on a fourth furnace that will bring the Hulwan iron and steel capacity to 1.5 million tons per year in 1976. The iron ore used has been from Aswan deposits and more recently from the higher quality Bahareza Oasis deposits in the Western Desert.

Egypt and Brazil are cooperating in iron ore ventures. The first step was construction of a $120 million iron ore pelletizing plant in Brazil using capital from Egypt's General Organization for Industrialization (GOFI), 70% and from Brazil's Companhia Vale do Rio Doce (CVRD), 30%. The plant will produce 4 million tons per year of iron pellets, 90% of which will be exported in Brazilian ore carriers to a new Egyptian sponge iron plant near Alexandria. This plant will be built by 1977 at a cost of $200 million, with the participation of Egypt, 50%; Japan, 25%; West Germany, 15%; and Brazil 10%. Natural gas from Egypt's Abu Qir gasfield will be piped 30 kilometers to provide reductant and fuel for the direct reduction of pellets. West Germany's Korf Industrie and Handel GmbH und Co. will provide the direct reduction technology for the plant. Japan's C. Itoh & Co. will handle organization and future exports to the Mediterranean area and Japan. International Engineering Co. of the United States will participate in technical studies. The plant is designed to produce 1.6 million tons per year of sponge iron and may be expanded to 5 million tons per year.

## NONMETALS

**Cement.**—The Egyptian National Building Material Co. has contracted with Marubeni Corp. and Kawasaki Heavy Industries Ltd. of Japan to construct a cement plant at Asnam. The plant may have a capacity of over 1 million tons per year and start production by 1978. The plant will utilize local limestone reserves totaling 200 million tons.

**Fertilizer and Materials.**—The Kuwait Fund for Arab Economic Development (KFAED) will lend Egypt $24 million of the $130 million needed to finance the second Talkha fertilizer plant, which is scheduled for completion in 1978. The 1,200-ton-per-day-capacity ammonia plant will use natural gas from the Abu Madi gasfield for feedstock. The first nitrogenous fertilizer plant at Talkha is expected to start production in 1975.

Egypt awarded an $80 million contract to Mannesmann-Export AG, and Friedrich Uhde, GmbH, of West Germany for construction of a urea fertilizer plant at Abu Qir near Alexandria by 1977. Natural gas from the Abu Qir offshore gasfield will be used in the production of 330,000 tons per year of ammonia, which will be utilized to produce 500,000 tons per year of urea fertilizers. Financing of nearly $300 million came from the West German Government and private industry.

*Phosphates.*—Egypt has considerable resources of phosphate rock, estimated to be around 1.4 billion tons. These resources are located near the Red Sea between Port Safaga and Kosseir (200 million tons), along the Nile River between Qina and Sebaia (200 million tons), and in the Western Desert on the Abu Tartur Plateau between the El Dakhla and El Kharga Oasis (1 billion tons).

Construction of the Hamrawayn phosphate complex near the Red Sea is progressing with Romanian participation. Upon completion in 1976, the complex will be able to produce 1,200,000 tons of crude phosphate per year.

## MINERAL FUELS

**Natural Gas.**—Estimated natural gas reserves totaled around 5 trillion cubic feet and were located in four dispersed areas: Abu Gharadiq (southwest of El Alamein), Abu Madi (northeast Nile Delta), Abu Qir (northeast of Alexandria offshore), and associated gas in the El Morgan Field (Gulf of Suez).

The Abu Gharadiq gasfield with reserves of 2.2 trillion cubic feet was being prepared for production in 1975. At that time 106 million cubic feet per day will be piped to the Hulwan industrial area.

Estimates of reserves of the Abu Madi field were doubled to 1.4 trillion cubic feet. The field started full production in October and has the capacity to send 106 million cubic feet per day to the Talkha nitrogenous fertilizer plant, an electric power station, and textile factories.

The offshore Abu Qir gasfield, with reserves of 1 trillion cubic feet, is expected to begin production in late 1975 at the rate of 106 million cubic feet per day. The KFAD has granted the Egyptian General Petroleum Corporation (EGPC) a loan of $14.5 million, which covers 45% of the project cost.

**Petroleum.**—*Exploration.*—During 1974, the production-sharing system devised by the EGPC met with continued success as 15 U.S. and European oil companies

acquired exploration rights for over 90,000 square kilometers in 17 concessions. The exploring companies are committed to bear all costs until a commercial oil discovery is made, when arrangements will be made for the foreign company to recover exploration and production costs. Offshore areas are subject to production-sharing contracts, and onshore acreage production will be a joint venture with EGPC. Contracts permit the operating company to use 40% of the production to recover costs, with the remaining 60% split from 85% to 70% and 15% to 30% between EGPC and the foreign company, respectively. The agreements also specify payment of signature and production bonuses. These contracts generally provide for 8-year exploration periods and 20 to 30 years of production thereafter. Among the 29 companies from 11 countries that have concessions in Egypt, the most involved are Phillips Petroleum Co., Exxon Corp., Continental Oil Co., Amoco International Oil Co., Shell Petroleum Co., Ltd., Agip, S.p.A. and Mobil Oil Corp.

## Table 4.—Egypt: Petroleum concession agreements with foreign companies signed during 1974

| Company and country | Location | Acreage (square kilometers) | Signature (s) and production (p) bonuses (million dollars) | Exploration commitments | Production sharing [1] |
|---|---|---|---|---|---|
| Standard Oil Co. (Indiana) (Amoco International Co.), United States. | Suez Gulf offshore (South Gharib). | 100 | 3 (S), 7 (P) | $2 million over 2 years. | 80–20 |
| Do | Suez Gulf offshore (South Belayim). | 600 | 8.5 (S), 12 (P) | $20.5 million over 7 to 5 years. | 85–15 |
| Do | Suez Gulf offshore (South Gharib). | 1,350 | 12 (S), 12 (P) | $29 million over 7 to 5 years. | 85–15 |
| Atlantic Richfield Co., United States | Western Desert (Marsa Matruh). | 3,320 | 2 (S), 6 (P) | $11 million over 8 years. | [2] 85–15 |
| Standard Oil Company of Calif., Chevron United States. | Western Desert (Qattara). | 6,900 | 2 (S), 14 (P) | $17 million over 8 years. | 80–20 |
| Continental Oil Company (Conoco), United States. | South Nile Delta | 8,500 | 6 (P) | $23 million over 10 years. | Oil 75–25, gas 67.5–32.5 |
| Exxon Corp., United States | Red Sea offshore | 12,000 | 4.5 ((S), 6 (P) | $48 million over 12 years. | 70/80–30/20 depending on water depth |
| Mobil Oil Corp., United States | Hurghada in Suez Gulf offshore. | 2,250 | 6 (S), 12 (P) | $21.5 million over 8 years. | 80–20 |
| Do | Sallum in Western Desert | 5,300 | 9 (P) | $8.25 million over 8 years. | 80–20 |
| Petroswede Oljeprospektering A.B., Sweden. | Natrum Valley northwest of Cairo. | 4,000 | 0.5 (S), 6 (P) | $10.5 million over 8 years. | 80–20 |
| Pexamin Pacific/LVO Corp., United States. | Desert (Natrum) southwest of Cairo. | 3,000 | 0.5 (S) | $9 million over 8 years. | 75–25 |
| Phillips Petroleum Co./Hispanoil, S.A., United States, Spain. | Red Sea offshore and onshore (Quseir). | 12,000 | 1 (S), 6 (P) | $45 million over 8 years. | 80–20 |
| Santa Fe International, United States | East of Cairo | 4,500 | 1 (S), 10 (P) | $18 million over 7 years. | 80–20 |
| Shell–DEMINEX–BP [3] Netherlands, West Germany, United Kingdom. | Suez Gulf offshore (North Belayim). | 1,350 | 7.5 (S), 12 (P) | $26 million over 7 years. | 82.5–17.5 |
| Shell International Petroleum Co. Ltd., United Kingdom. | Western Desert (al-Daba). | 8,500 | 3 (S), 8 (P) | $39.5 million over 8 years. | 80–20 |
| Do | Western Desert (Sidi Barrani). | 6,400 | 2.5 (S), 8 (P) | $25.5 million over 8 years. | 80–20 |
| Union Oil Company of Calif., United States. | Red Sea offshore, town of Safaga. | 10,000 | 5.5 (S), 10 (P) | $30 million over 7 years. | 85–15 |

[1] Percentage production sharing between EGPC (first figure) and foreign company (second figure), after prior allocation of 40% of production to cover the latter's costs.
[2] In this agreement, EGPC has abandoned its rights to the General Petroleum Company (GPC).
[3] Shell International Petroleum Co. Ltd., Netherlands; Erdölversorgungsgesellschaft, mbH, West Germany; British Petroleum Co., Ltd., United Kingdom.

These new concessions are part of an Egyptian Government program to increase oil production from the current 200,000 barrels to 1 million barrels per day by 1982. To reach this production goal, EGPC believes it will be necessary to attain certain levels of investment, exploratory drilling, and concession leasing. Of the estimated $800 million in investment needed for exploration, $500 million has already been committed by foreign oil companies. By the end of 1974, 37% of the planned exploration area covering 500,000 square kilometers was held in concessions. However, exploratory drilling will have to increase dramatically to achieve the goal of 400 wells by 1982.

Seismic activity increased in 1974 to 57.2 party-months covering 22,034 line-kilometers, of which 71% was offshore. Onshore seismic activity occured in the Western Desert and the Nile Delta, while offshore activity areas included the Suez Gulf and the Mediterranean Sea.

**Table 5.—Seismic exploration in Egypt, 1974**

| Company | Party months | | Line kilometers |
|---|---|---|---|
| | Onshore | Offshore | |
| Petrobras Internacional S.A. (Braspetro) | 12.0 | XX | 2,150 |
| Chevron | .2 | XX | 12 |
| Deminex | XX | 1.0 | 2,059 |
| Exxon Corp | XX | 1.7 | 3,934 |
| Faiyum Petroleum Co. (FAPCO) | 12.0 | XX | 2,175 |
| General Petroleum Co. (GPC) | 22.0 | 2.8 | [1]8,006 |
| International Egyptian Oil Co. (IEOC) | 1.8 | XX | 125 |
| Mobil Oil Corp | XX | 1.1 | 2,089 |
| Union Oil Co. of California | XX | .6 | 1,269 |
| Western Desert Operating Co. (WEPCO) | 2.0 | XX | 215 |
| Total | 50.0 | 7.2 | 22,034 |

XX Not applicable.
[1] 1,740 line—kilometers onshore.
Source: The American Association of Petroleum Geologists.

**Table 6.—Summary of drilling in Egypt, 1974**

| Company | Exploratory | | Extension and development | | | Footage |
|---|---|---|---|---|---|---|
| | Oil | Total completed | Oil | Gas | Total completed | |
| Offshore | | | | | | |
| AMOCO | -- | 1 | -- | -- | -- | NA |
| GPC | -- | -- | 5 | -- | 7 | 27,300 |
| GUPCO | 1 | 3 | 2 | -- | 5 | 83,000 |
| Transworld | -- | -- | -- | -- | -- | 9,500 |
| Total offshore | 1 | 4 | 7 | -- | 12 | 119,800 |
| Onshore | | | | | | |
| FAPCO | -- | 2 | 1 | 1 | 4 | 52,800 |
| GPC | -- | 3 | 10 | -- | 11 | 76,100 |
| NIPCO | -- | -- | 1 | -- | 2 | 14,900 |
| WEPCO | -- | 3 | 3 | -- | 3 | 57,400 |
| Total onshore | -- | 8 | 15 | 1 | 20 | 201,200 |
| Total 1974 | 1 | 12 | 22 | 1 | 32 | 321,000 |
| Total 1973 | 2 | 15 | NA | NA | 30 | 343,600 |

NA Not available.
Source: The American Association of Petroleum Geologists.

A total of 44 wells were drilled, of which 12 were exploratory. The Gulf of Suez Petroleum Co. (GUPCO), the joint operating company of Amoco Egypt Oil Co. and EGPC, discovered a new oilfield in September 1974, which was named Ramadan. GUPCO had discovered the July Field in the Gulf of Suez during 1973.

*Production.*—In the early months of

1974 production was depressed to 58,000 barrels per day as a result of the October 1973 conflict. However, by the end of 1974 the production rate had attained the prewar level of 192,000 barrels per day, resulting in a yearly average of 147,060 barrels per day. The newly discovered Ramadan Field started initial production in late 1974. The pay zone is 1,300 feet thick and contains 31.7° gravity crude oil. The July Field, discovered in 1973, was linked to El Morgan facilities and started production in April at 20,000 barrels per day. The July Field pay zone was reported to be 740 feet thick with reserves of 600 million barrels of 34° gravity oil having a 1% sulfur content. Egypt's largest oilfield, El Morgan, has had declining production for several years. Plans are being made to reverse this trend by a $40 million water injection program to start in early 1976. With the full implementation of the water injection program and the return of the Sinai oilfields, Egypt could realize a production level of 350,000 barrels per day by 1976.

*Pipelines.*—The operating and financing company of the Suez-to-Mediterranean pipeline changed its name to Arab Oil Pipeline Co., but kept the acronym SUMED to describe the pipeline. EGPC retains 50% ownership in the company, and Abu Dhabi, Kuwait, Qatar, and Saudi Arabia will share the remaining equity. Construction started on the pipeline, and one-third of the 42-inch pipes were delivered. In April 1974 Bechtel Corp. relinquished its building contract after a request for a 17% cost increase was turned down. Bechtel still retains a supervisory role. The SUMED pipeline will now be built by a consortium of Italian Government-controlled companies that includes SNAM Progetti, S.p.A., SAIPEM S.p.A. of Ente Nazionale Idrocarburi, and others. The pipeline may be completed during 1976 with a capacity of 1.6 million barrels per day.

The Government-owned Suez Oil Processing Co. won a $6.5 million contract to build a 168-mile gas pipeline from the Abu Gharadiq wells to the Hulwan industrial area. Another Government concern, the Petroleum Pipelines Co., received a $60 million contract to build a crude oil pipeline from the Ras Gharib Field on the Gulf of Suez to the refinery at Musturud. In late 1974 work began on an $11.5 million gas pipeline from the Abu Qir offshore gasfield to the al-Dakhilah industrial area west of Alexandria. The line is due to be completed during 1977 to provide for urea fertilizer plants and the direct reduction of iron ore.

*Refining.*—Just before the October 1973 war, Egypt had almost regained the refining capacity it held before the 1967 war. Current efforts are to regain the 180,000-barrel-per-day capacity by rebuilding refineries including the two Suez refineries damaged by the 1967 and 1973 wars.

Plans for a $400 million, 250,000-barrel-per-day export refinery to be built in the Alexandria free export zone were expanded to include petrochemicals. Feedstocks for the refinery would come from the SUMED pipeline. Feedstocks from this and other Egyptian refineries would supply petrochemical projects throughout Egypt. Some of these plans include the annual production of 6,000 tons of polyesters, 80,000 tons of dimethyl terephthalate, 80,000 tons of ethylene, 10,000 tons of butadiene, 45,000 tons of polyethylene, and 80,000 tons of vinylchlorides. Most of these projects are based in Alexandria to meet the needs of domestic and export markets.

# The Mineral Industry of Finland

By F. L. Klinger [1]

Output of the Finnish mineral industry in 1974 appeared to equal or exceed the 1973 level, despite declines in official indices of production in the mining and primary metals sectors. Production and apparent consumption of some key commodities, such as steel and cement, were at record levels.

Gross output from mines and quarries was up 9%. Development of new mines was continued near Kolari (iron ore) and at Mustavaara (iron ore and vanadium). The Metsämonttu mine, long a source of nonferrous and precious metals, was closed, as were the Kylmäkoski (copper) and Petolahti (copper and nickel) mines. Other copper-nickel deposits were being explored. In northeastern and east-central Finland, carbonatite complexes at Sokli and Siilinjärvi were being extensively drilled and tested as possible commercial sources of phosphate, rare-earth oxides, and columbium.

New plant developments included expansion of sulfuric acid plants at Kokkola and Harjavalta, construction of a second blast furnace and expansion of steelmaking facilities at Raahe, construction of a stainless steel works near Tornio, and expansion of the petroleum refinery at Porvoo. Finnish smelting technology for copper and nickel continued to be exported to many countries, including India, the Soviet Union, and Zaire in 1974.

The high cost of imported fuels, which greatly increased Finland's trade deficit in 1974, focused attention on alternative sources of energy such as the country's large resources of peat. A new trade agreement with the Soviet Union provided for a significant increase in imports of electric power as well as a continued supply of crude oil. Meanwhile, imports of natural gas by pipeline from the Soviet Union began in 1974, and construction of two nuclear powerplants was continued near Loviisa.

## PRODUCTION

Volume indices of production in the principal sectors of the mineral industry are shown in the following tabulation:

| Sector | (1970=100) | | |
|---|---|---|---|
| | 1972 [r] | 1973 [r] | 1974 |
| Mining and quarrying | 94 | 93 | 87 |
| Nonmetallic mineral processing | 115 | 124 | 132 |
| Primary metals industry | 115 | 134 | 130 |
| Chemical industry | 142 | 151 | 158 |
| Petroleum refining [1] | 102 | 111 | 107 |
| All industry | 114 | 121 | 123 |

[r] Revised.
[1] Including manufacture of rubber and plastics.

Source: Central Statistical Office of Finland (Helsinki). Tilastokatsauksia (Bulletin of Statistics), No. 2, 1975, pp. 8–9.

Published statistics on production of individual mines and quarries indicated that combined output of crude ore and waste rock in 1974 was about 9% more than in 1973, and that production of crude ore alone increased about 5%.[2] Most of the gains were registered in industrial minerals and stone, although there were substantial increases in output at some major mines producing copper, nickel, and other metals. Total output of iron ore was down, but production of pelletized by-product iron concentrates, from sulfide ores, increased. Production of pyrite concentrates continued to decline.

[1] Physical scientist, Division of Ferrous Metals.
[2] Vuoriteollisuus-Bergshanteringen. V. 33, No. 1, 1975, pp. 48–49; v. 32, No. 1, 1974, pp. 38–39.

In the manufacturing sector, production of most metals increased, although output of pig iron, copper, cadmium, and cobalt was less than in 1973. Production of elemental sulfur declined by 20%, but output of cement and petroleum products increased.

Production of mineral commodities is detailed in table 1.

**Table 1.—Finland: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| METALS | | | |
| Aluminum, secondary | 4,000 | 4,900 | 5,300 |
| Cadmium, refined metal | 175 | 179 | 156 |
| Chromium, chromite: | | | |
| Gross weight: | | | |
| Concentrate | 97,390 | 135,203 | 126,242 |
| Foundry sand | 6,786 | 12,307 | 28,419 |
| Chrome oxide content: | | | |
| Concentrate | 41,488 | 57,461 | 53,148 |
| Foundry sand | 3,169 | 5,809 | 13,300 |
| Cobalt: | | | |
| Mine output, metal content e | 1,300 | 1,300 | 1,300 |
| Metal, refined | 803 | 1,010 | 812 |
| Copper: | | | |
| Mine output, metal content | 34,824 | 38,213 | 36,667 |
| Metal: | | | |
| Primary: | | | |
| Blister | 41,500 | 48,100 | 48,400 |
| Electrolytic | 38,424 | 42,907 | 38,277 |
| Secondary (unrefined) | 17,425 | 18,771 | 17,014 |
| Gold metal troy ounces | 17,619 | 19,773 | 20,737 |
| Iron and steel: | | | |
| Iron ore: | | | |
| Magnetite concentrate thousand tons | 573 | 589 | 569 |
| Pelletized iron oxide (from pyrite) do | 280 | 164 | 236 |
| Roasted pyrite (purple ore) do | 142 | 143 | 132 |
| Pig iron do | 1,183 | 1,412 | 1,381 |
| Ferrochromium do | 24 | 40 | 48 |
| Steel: | | | |
| Crude: | | | |
| Ingots do | 1,456 | 1,615 | 1,617 |
| Castings do | 18 | 18 | 39 |
| Semimanufactures (rolled) do | 930 | 1,135 | 1,124 |
| Lead, mine output, metal content | r 3,849 | 2,128 | 1,478 |
| Mercury 76-pound flasks | 212 | 196 | 183 |
| Nickel: | | | |
| Mine output, metal content | 5,159 | 5,760 | 5,762 |
| Sulfate, metal content | 191 | 220 | 186 |
| Metal, electrolytic | 5,458 | 5,839 | 6,455 |
| Platinum metal e troy ounces | 650 | 725 | 650 |
| Selenium metal kilograms | 5,069 | 9,171 | 9,690 |
| Silver metal troy ounces | 625,138 | 793,351 | 810,712 |
| Titanium concentrate, ilmenite, gross weight | 149,500 | 159,000 | 152,000 |
| Vanadium pentoxide: | | | |
| Gross weight | r 2,124 | 2,248 | 2,647 |
| Vanadium content | 1,190 | 1,259 | 1,483 |
| Zinc: | | | |
| Mine output, metal content | 49,893 | 58,592 | 58,837 |
| Metal | 81,096 | 80,662 | 91,786 |
| NONMETALS | | | |
| Asbestos | 6,388 | 6,337 | 5,593 |
| Cement, hydraulic thousand tons | 1,984 | 2,092 | 2,203 |
| Feldspar | 59,858 | 58,318 | 63,577 |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous thousand tons | 305 | 321 | 311 |
| Phosphatic (superphosphate) do | 101 | 77 | 62 |
| Mixed and other do | 968 | 1,015 | 1,085 |
| Lime do | 235 | 233 | 245 |
| Pyrite: | | | |
| Gross weight do | 857 | 777 | 722 |
| Sulfur content do | 386 | 350 | 340 |
| Stone: | | | |
| Limestone and dolomite: | | | |
| For cement do | 2,597 | 2,909 | 3,202 |
| For lime do | 434 | 446 | 512 |
| For sulfite and metallurgical uses do | 155 | 153 | 144 |
| Other do | 716 | 838 | 774 |
| Quartz do | 92 | 93 | 120 |

See footnotes at end of table.

Table 1.—Finland: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Sulfur, byproduct (recovered): | | | | |
| Elemental | | 119,221 | 122,715 | 99,589 |
| Gaseous (in $SO_2$) | | 250,352 | 240,540 | 246,685 |
| Talc | | 90,327 | 109,704 | 128,269 |
| Wollastonite | | 6,491 | 6,547 | 9,118 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Coke, all types | thousand tons | 86 | 67 | -- |
| Gas, manufactured | million cubic feet | 1,708 | 1,572 | NA |
| Peat: | | | | |
| For fuel use | thousand tons | 151 | 240 | 116 |
| For agricultural and other use | do | 127 | 155 | 127 |
| Petroleum refinery products: | | | | |
| Gasoline | thousand 42-gallon barrels | 10,379 | 12,786 | 11,994 |
| Jet fuel | do | 1,064 | 1,126 | 1,285 |
| Kerosine | do | 54 | 55 | -- |
| Distillate fuel oil | do | 20,515 | 18,310 | 18,067 |
| Residual fuel oil | do | 26,327 | 23,523 | 25,085 |
| Liquefied petroleum gas | do | 4,451 | 1,877 | 1,098 |
| Other | do | | 3,089 | 3,661 |
| Refinery fuel and losses | do | 6,550 | 5,424 | 5,445 |
| Total | do | 69,340 | 66,190 | 66,635 |

e Estimate. p Preliminary. r Revised. NA Not available.

## TRADE

Exports of mineral commodities in 1974 were valued at about $450 million,[3] 35% more than in 1973. Metals (principally iron and steel, copper, nickel, and zinc) continued to account for more than two-thirds of the total value.

Imports of mineral commodities in 1974 were valued at about $2.5 billion, more than twice the value of imports in 1973. Liquid fuels accounted for nearly 50% of the total value, followed by iron and steel with 16%.

The net trade deficit attributable to mineral commodities in 1974 was approximately $2 billion, an increase of nearly threefold compared with the 1973 figure. The main cause of the deficit was the increasing cost of imported crude oil and petroleum products in 1974.

Finland's trade in mineral commodities in 1972 and 1973 is shown in tables 2 and 3.

[3] Where necessary, values have been converted from Finland marks (Fmk) to U.S. dollars at the rate of Fmk 3.816=US$1.00 for 1973 and Fmk 3.774=US$1.00 for 1974.

Table 2.—Finland: Exports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum metal including alloys: | | |
| Scrap | 88 | 69 |
| Unwrought | 840 | 1,484 |
| Semimanufactures | 11,209 | 11,478 |
| Chromium, chromite | 15,111 | 30,466 |
| Cobalt metal, unwrought and semimanufactures | 860 | 991 |
| Copper: | | |
| Ore and concentrate | 25 | 2 |
| Metal including alloys: | | |
| Unwrought, including matte | 7,761 | 24,492 |
| Semimanufactures | 15,456 | 14,258 |
| Gold metal, unworked or partly worked, troy ounces | 3,045 | 93 |
| Iron and steel: | | |
| Ore and concentrate, except roasted pyrite | 8,278 | -- |
| Metal: | | |
| Scrap | 11,133 | 6,383 |
| Pig iron, ferroalloys, spiegeleisen, similar materials | 188,979 | 180,506 |
| Steel, primary forms | 266,255 | 230,164 |
| Semimanufactures | r 71,076 | 85,665 |

See footnotes at end of table.

## Table 2.—Finland: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS—Continued | | |
| Lead: | | |
| Ore and concentrate | 5,911 | 11,627 |
| Metal including alloys: | | |
| Scrap | 5 | 216 |
| Unwrought | (1) | 88 |
| Mercury 76-pound flasks | 218 | 209 |
| Nickel metal including alloys: | | |
| Unwrought | 4,749 | 5,618 |
| Semimanufactures | 34 | 33 |
| Platinum-group metals including alloys troy ounces | 1,415 | 219 |
| Silver metal including alloys thousand troy ounces | 1,311 | 1,188 |
| Tin metal including alloys: | | |
| Scrap long tons | 15 | 22 |
| Unwrought do | 1 | 38 |
| Semimanufactures do | (1) | (1) |
| Titanium: | | |
| Ore and concentrate | 9,079 | -- |
| Oxides | 2,883 | 1,773 |
| Vanadium oxides | 2,440 | 2,354 |
| Zinc: | | |
| Ore and concentrate | 100 | -- |
| Oxide | 14 | 3 |
| Metal: | | |
| Scrap | 267 | 139 |
| Unwrought | 67,821 | 64,966 |
| Semimanufactures | 8 | 4,355 |
| Other: | | |
| Ash and residue containing nonferrous metals | 9,583 | 10,878 |
| Waste and sweepings of precious metals kilograms | 49,339 | 6,409 |
| NONMETALS | | |
| Asbestos | 5,576 | 5,225 |
| Cement | 170,751 | 173,823 |
| Clay products: | | |
| Refractory (including brick) | 349 | 491 |
| Nonrefractory | 1,204 | 1,407 |
| Diatomite and other infusorial earth | 36 | 115 |
| Feldspar | 44,136 | 40,993 |
| Fertilizer materials, manufactured: | | |
| Nitrogenous | 48,226 | 66,730 |
| Phosphatic, excluding Thomas slag | 77,824 | -- |
| Other, including mixed | 19,309 | 53,750 |
| Graphite, natural | -- | 15 |
| Lime | 38 | 35 |
| Precious and semiprecious stones, except diamond: | | |
| Natural carats | 1,424,500 | 2,710,500 |
| Manufactured do | 4,500 | 500 |
| Sodium and potassium compounds, n.e.s., caustic soda | 1,236 | 606 |
| Stone, sand and gravel: | | |
| Dimension stone | 25,205 | 28,122 |
| Other stone: | | |
| Limestone | 14,242 | 16,075 |
| Quartz and quartzite | 36 | 386 |
| Crushed, broken and gravel, n.e.s | 2,347 | 17,933 |
| Sand, excluding metal bearing | 454 | 537 |
| Sulfur: | | |
| Elemental, all forms | 33,670 | 31,022 |
| Sulfuric acid | 79,361 | 93,157 |
| Talc and steatite | 3,934 | 5,668 |
| Other nonmetals, n.e.s.: | | |
| Slag, dross, and similar waste, not metal bearing.: | | |
| From manufacture of iron and steel | 111 | 6,223 |
| Slag and ash, n.e.s | 163 | 428 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 7,261 | 3,657 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Asphalt and bitumen, natural | 1 | 147 |
| Carbon black | 28 | (1) |
| Coke and semicoke | 20,400 | 23,592 |
| Hydrogen, helium, rare gases | 1 | -- |
| Peat, including peat briquets and litter | 12,572 | 16,376 |
| Petroleum refinery products: | | |
| Gasoline thousand 42-gallon barrels | r 797 | 926 |
| Distillate fuel oil do | r 296 | 477 |
| Lubricants do | r 14 | 17 |
| Other: | | |
| Liquefied petroleum gas do | 9 | 10 |
| Naphtha do | 143 | (1) |
| Mineral jelly and wax do | (1) | 2 |
| Nonlubricating oils, n.e.s do | 2 | 1 |

See footnotes at end of table.

## Table 2.—Finland: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | |
| Petroleum refinery products—Continued | | |
| Other—Continued | | |
| Bitumen and bituminous mixtures, n.e.s | | |
| thousand 42-gallon barrels | 1 | 2 |
| Unspecified do | (1) | (1) |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 1,424 | 2,544 |

r Revised.
1 Less than ½ unit.

## Table 3.—Finland: Imports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum: | | |
| Ore and concentrate | 2,055 | 2,944 |
| Oxide and hydroxide | 18,520 | 19,943 |
| Metal including alloys: | | |
| Unwrought | 16,735 | 74,943 |
| Semimanufactures | 20,438 | 22,483 |
| Antimony metal including alloys, all forms | 47 | 32 |
| Arsenic trioxide, pentoxide, acids | 358 | 500 |
| Cadmium metal including alloys, all forms | 3 | 1 |
| Chromium: | | |
| Chromite | 889 | 505 |
| Oxide and hydroxide | 346 | 592 |
| Cobalt: | | |
| Oxide and hydroxide | 2 | 1 |
| Metal including alloys, all forms | 3 | 2 |
| Copper: | | |
| Ore and concentrate | 598 | 3,091 |
| Copper sulfate | 1,566 | 1,949 |
| Metal including alloys: | | |
| Scrap | 27 | -- |
| Unwrought | 9,226 | 9,195 |
| Semimanufactures | 8,300 | 9,962 |
| Gold metal, unworked or partly worked troy ounces | 119,212 | 112,171 |
| Iron and steel: | | |
| Ore and concentrate, except roasted pyrite | 770,630 | 947,840 |
| Metal: | | |
| Scrap | 67,046 | 68,142 |
| Pig iron, including cast iron | 1,493 | 9,847 |
| Sponge iron, powder, and shot | 3,545 | 3,046 |
| Ferroalloys | 22,875 | 25,788 |
| Steel, primary forms | 30,085 | 18,210 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections | r 191,102 | 279,100 |
| Universals, plates, sheets | r 328,793 | 273,410 |
| Hoop and strip | 37,464 | 51,960 |
| Rails and accessories | 1,971 | 2,550 |
| Wire | 11,532 | 15,726 |
| Tubes, pipes, fittings | 117,266 | 155,132 |
| Castings and forgings, rough | 1,230 | 1,176 |
| Lead: | | |
| Ore and concentrate | NA | -- |
| Oxides | 445 | 359 |
| Metal including alloys: | | |
| Unwrought | 12,267 | 10,129 |
| Semimanufactures | 971 | 919 |
| Magnesium metal including alloys, all forms | 55 | 15 |
| Manganese: | | |
| Ore and concentrate | 5,180 | 44 |
| Oxides | 1,250 | 900 |
| Mercury 76-pound flasks | 513 | 383 |
| Molybdenum metal including alloys, all forms | 2 | 5 |
| Nickel: | | |
| Ore and concentrate | r 11,999 | 10,303 |
| Metal including alloys: | | |
| Scrap | 20 | -- |
| Unwrought | 121 | 133 |
| Semimanufactures | 228 | 133 |
| Platinum-group metals thousand troy ounces | 6 | 9 |
| Silver metal including alloys do | 2,079 | 2,873 |
| Silicon | 251 | 321 |

See footnote at end of table.

## Table 3.—Finland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS—Continued | | |
| Tin: | | |
| Oxides ---- long tons -- | 7 | 7 |
| Metal including alloys: | | |
| Unwrought ---- do ---- | 237 | 311 |
| Semimanufactures ---- do ---- | 73 | 111 |
| Titanium: | | |
| Ore and concentrate | 304 | 2,082 |
| Oxides | 111 | 160 |
| Tungsten metal including alloys, all forms | 36 | 13 |
| Zinc: | | |
| Oxides | 382 | 398 |
| Metal including alloys: | | |
| Scrap | 372 | 342 |
| Unwrought | 2,496 | 1,787 |
| Semimanufactures | r 821 | 784 |
| Other: | | |
| Ore and concentrate | 536 | 171 |
| Metal including alloys, all forms: | | |
| Metalloids, n.e.s | 9 | 15 |
| Pyrophoric alloys | 3 | 1 |
| Base metals, n.e.s | 251 | 247 |
| NONMETALS | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | 177 | 156 |
| Dust and powder of precious and semiprecious stones, except diamond ---- kilograms -- | 1 | 3 |
| Grinding and polishing wheels and stones | 1,977 | 2,326 |
| Asbestos | 4,722 | 4,911 |
| Barite and witherite | 1,332 | 1,783 |
| Borates, crude, natural | 8,122 | 10,263 |
| Cement | 7,654 | 88,329 |
| Chalk | 8,476 | 11,447 |
| Clays and clay products (including all refractory brick): | | |
| Crude clays, n.e.s.: | | |
| Kaolin | 267,921 | 318,108 |
| Other | 32,281 | 20,675 |
| Products: | | |
| Refractory (including nonclay brick) | 32,723 | 39,541 |
| Nonrefractory | 1,103 | 1,603 |
| Cryolite and chiolite | 41 | 58 |
| Diamond: | | |
| Gem, not set or strung ---- carats -- | 500 | 1,000 |
| Industrial ---- do ---- | 39,500 | 24,000 |
| Diatomite | 948 | 854 |
| Feldspar, leucite, nepheline syenite | 11 | 15 |
| Fertilizer materials: | | |
| Crude, phosphatic | 443,054 | 591,225 |
| Manufactured: | | |
| Nitrogenous | 46,957 | 17,929 |
| Phosphatic | 4,707 | 713 |
| Potassic | 234,118 | 283,476 |
| Other, including mixed | 4,786 | 4,706 |
| Ammonia | 79,526 | 75,133 |
| Fluorspar | 5,124 | 4,208 |
| Graphite, natural | 271 | 389 |
| Gypsum and plasters | 135,844 | 135,346 |
| Lime | 16 | 2,231 |
| Magnesite | 2,978 | 2,446 |
| Mica, all forms | 360 | 270 |
| Pigments, mineral: | | |
| Natural, crude | 77 | 118 |
| Iron oxides, processed | 2,022 | 2,475 |
| Precious and semiprecious stones, except diamond: | | |
| Natural ---- kilograms -- | 6,182 | 2,629 |
| Manufactured ---- do ---- | 363 | 158 |
| Salt (excluding brine) | 476,236 | 492,188 |
| Sodium and potassium compounds, n.e.s.: | | |
| Caustic soda | 36,037 | 19,711 |
| Caustic potash | 255 | 289 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude and partly worked | 208 | 364 |
| Worked | 454 | 1,482 |
| Dolomite, chiefly refractory grade | 5,112 | 6,943 |
| Gravel and crushed rock | 2,720 | 3,785 |
| Limestone, except dimension | 382,612 | 355,172 |
| Quartz and quartzite | 1,643 | 1,039 |
| Sand, excluding metal-bearing | 90,805 | 89,450 |
| Sulfur: | | |
| Elemental | 40,921 | 28,981 |
| Sulfuric acid | 48 | 33 |
| Talc and steatite | 5,157 | 3,829 |

See footnote at end of table.

Table 3.—Finland: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Other nonmetals, n.e.s.: | | | |
| Slag, dross and similar waste, not metal bearing: | | | |
| From iron and steel manufacture | | 6,450 | 2 |
| Slag and ash, n.e.s | | 100 | 100 |
| Oxides and hydroxides of magnesium, strontium, barium | | 5,294 | 11,698 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | | 266 | 321 |
| Carbon black and gas carbon | | 5,882 | 7,099 |
| Coal, all grades, including briquets | thousand tons | r 2,663 | 2,973 |
| Coke and semicoke | do | 722 | 832 |
| Hydrogen, helium, rare gases | | 164 | 95 |
| Peat, including peat briquets and litter | | 28 | 33 |
| Petroleum: | | | |
| Crude and partly refined | thousand 42-gallon barrels | r67,908 | 69,948 |
| Refinery products: | | | |
| Gasoline | do | r 524 | 855 |
| Jet fuel | do | 96 | 48 |
| Kerosine | do | 64 | 56 |
| Distillate fuel oil | do | r 15,722 | 13,194 |
| Residual fuel oil | do | 10,227 | 15,008 |
| Lubricants | do | r 628 | 663 |
| Other: | | | |
| Liquefied petroleum gas | do | r 224 | 110 |
| Naphtha | do | -- | 246 |
| White spirit | do | 61 | 72 |
| Mineral jelly and wax | do | 90 | 99 |
| Nonlubricating oils, n.e.s | do | 23 | 13 |
| Bitumen and bituminous mixtures, n.e.s | do | 301 | 254 |
| Pitch, pitch coke, petroleum coke | do | 8 | 7 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | 12,497 | 16,059 |

r Revised. NA Not available.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Finland continued to import all of its aluminum requirements. Imports of wrought and unwrought aluminum and alloys in 1974 totaled nearly 57,000 tons valued at $64 million. Compared with 1973, imports of semimanufactures rose 39% and imports of ingot rose 28%. Domestic consumption in the first half of 1974 was running 20% to 25% ahead of the 1973 level, and may have reached 11 kilograms per capita in 1974.[4] A new extrusion plant apparently began production in Finland in 1974; domestic production of extruded products and wire during the first 6 months of 1974 was at the rate of about 25,000 tons per year, 15% to 20% more than the rate in 1973.

**Chromium.**—Production and exports of chromite and ferrochromium increased significantly in 1974. Compared with 1973, output of crude ore at Kemi was up 9% to 410,000 tons, and output of concentrates was up 11% to 165,480 tons averaging 42% $Cr_2O_3$. Exports of chromite (partly as foundry sand averaging 46% $Cr_2O_3$) in 1974 rose to 83,942 tons valued at $3 million, nearly triple the quantity and value of exports in 1973.

Production of ferrochromium at Tornio was up 21%. Exports rose to 43,573 tons valued at $11.2 million, an increase of 13% in quantity and 80% in value compared with the 1973 figures.

Reserves of chromite ore were reported to be 33 million tons, averaging 27% $Cr_2O_3$ and a Cr:Fe ratio of 1.6:1.[5] The reserves are contained in eight ore bodies, of which the largest (Elijärvi) contained 14.5 million tons and is now being mined. All of the ore bodies are found along a continuous layer of chromite which ranges from a few centimeters to 2 meters in thickness. In 1977, mining will shift to the Viianlahti-Viianranta ore body nearby.

**Cobalt.**—Production and exports of cobalt metal in 1974 were less than in 1973. The reduced output appeared to be partly due to declining production of cobaltiferous pyrite at Outokumpu, and to a lower metal content of cobalt concentrates produced elsewhere such as at Luikonlahti. The

[4] Aluminium (Düsseldorf). V. 51, No. 1, January 1975, pp. 52–54.
[5] Outokumpu Oy (Helsinki). Outokumpu News, No. 2, 1975, p. 10.

reported output of cobalt concentrates in 1974 was up 25% compared with that of 1973, but the average cobalt content was only 0.5% compared with 0.07% in 1973. Exports of cobalt metal in 1974 totaled 807 tons valued at about $6.7 million.

**Copper and Nickel.**—Mine output of copper and nickel in 1974 was slightly less than in 1973, although more crude ore was mined in 1974. The average grade of copper concentrate was 21.3% Cu (21.9% in 1973), and the average grade of nickel concentrate was 4.9% Ni (4.7% in 1973). Ore containing copper and nickel was produced at five mines during 1974; the number was reduced to three by yearend as ore reserves were exhausted at the Kylmäkoski and Petolahti deposits. Ore containing only copper was produced at the Hammaslahti and Hällinmaki (Virtasalmi) mines. Most of the copper continued to be produced at the Outokumpu, Pyhäsalmi, Vihanti, and Luikonlahti mines, while the principal mine sources of nickel were the Vuonos and Kotalahti deposits. Two nickel-copper prospects were being explored in 1974, the Stormi deposit in Vammala parish, and the Pahtovuoma deposit in Kittilä parish.

Output of refined copper in 1974 was about 11% less than in 1973, while output of electrolytic nickel was 11% greater. Imports of concentrates for refining rose to new highs in 1974; imports of copper concentrate totaled 36,000 tons, while imports of nickel concentrate (mostly from Norway) were 12,600 tons. Exports of copper including alloys dropped by more than 30%, to 27,000 tons in 1974, while imports increased nearly 40% to about the same quantity. Trade in copper in 1974 was valued at about $65 million in both exports and imports, whereas a $35 million surplus had been realized in 1973. Exports of refined nickel in 1974 declined slightly to about 5,500 tons, but the total value (about $20 million) was 9% more than in 1973.

**Iron Ore.**—Development of the Rautavaara underground iron mine in Lapland was continued by Rautaruukki Oy. Production of concentrate was expected to begin in the fall of 1975, at the rate of 500,000 tons per year. All of the concentrate will be shipped to blast furnaces at Raahe.

The Mustavaara vanadium mine, now under construction, was expected to supply about 200,000 tons of pelletized iron ore per year to Raahe, beginning in 1976.

Production of iron concentrates in 1974 included 569,000 tons produced by Rautaruukki Oy., from the Otanmäki and Raajärvi mines, and 368,000 tons of iron oxide residues obtained from processing of pyrite and pyrrhotite by Outokumpu Oy. at Kokkola. Average iron content of all concentrates produced in 1974 was 65.5%.

Imports of iron ore in 1974 totaled 1,133,000 tons, about 20% more than in 1973. Value of imports was approximately $20 million.

**Iron and Steel.**—Production of iron and steel continued at near-capacity levels in 1974. Output of raw steel set a new record. Net imports of steel semimanufactures increased to nearly 400,000 tons, and apparent consumption was about 1.5 million tons, 8% more than in 1973. Strong domestic demand arose from relatively high levels of activity in the shipbuilding, engineering, and construction industries. Exports included 170,000 tons of pig iron and 451,000 tons of steel semimanufactures, principally ingots and other crude forms. Exports of iron and steel in 1974 were valued at $142 million, while imports were valued at $408 million.

Rautaruukki Oy., at Raahe, produced 56% of Finland's output of pig iron in 1974, and 49% of the raw steel. The rest was produced by the Ovako group in plants at Imatra, Koverhar, and Turku. Rautaruukki's mill at Hämeenlinna accounted for all production of cold-rolled products (234,000 tons) in 1974, and the company was planning to double the plant's production capacity. Rautaruukki continued construction of a new blast furnace, an oxygen plant, a plate mill, and extensions to the steel mill and the continuous-casting plant in 1974. The company's production capacity for raw steel will be 1.7 million tons annually by the end of 1976, about twice the 1974 production.

Outokumpu Oy. was planning to build a plant for production of stainless steel. The plant will be located in north Finland, near the company's ferrochromium works, and will have a production capacity of 50,000 tons of stainless steel per year. Construction was expected to be completed by the end of 1976. Domestic demand for

stainless steel in 1976 was estimated by the company at 30,000 tons.[6]

In November 1974, agreements between Finland and countries of the European Coal and Steel Community were ratified.[7] The agreements apparently concerned conformity of pricing and freight costs, and were to become effective January 1, 1975. A similar agreement was made between Finland and Sweden.

**Lead and Zinc.**—Mine production of zinc in 1974 was about 4% more than in 1973. Output of concentrates was up 7%, but the average zinc content dropped to 51.7% (53.1% in 1973). Imports of zinc concentrate rose by 111% to 112,000 tons in 1974, and output of slab zinc was up 14% compared with that of 1973. Exports of metal remained at the 69,000-ton level in 1974, but total value increased about 50% to $53 million. Apparent consumption of zinc and alloys in 1974 rose to 24,000 tons.

Most of the mine lead produced in 1974 came from the Vihanti mine, which is primarily a producer of copper, zinc, and sulfur concentrates. Most of the lead concentrate was exported.

The Metsämonttu mine in southwestern Finland, a long-time source of copper, lead, zinc, gold, and silver, was closed in 1974 owing to exhaustion of ore reserves.

Imports of lead and lead alloys in 1974 totaled 14,600 tons valued at more than $9 million.

**Titanium.**—Finland's production of ilmenite continued to come solely from the Otanmäki mine as a byproduct of iron ore concentration. The ilmenite was processed by Kemira Oy. (formerly Rikkihappo Oy.) at Mantyluoto to make titanium dioxide and pigment. The plant has a production capacity of 80,000 tons of titanium dioxide per year and uses the sulfate process.

Exports in 1974 included 41,516 tons of titanium white valued at nearly $41 million, and 1,800 tons of titanium dioxide. Imports of 17,560 tons of ilmenite concentrate were reported in 1974, compared with 2,100 tons in 1973.

**Vanadium.**—Construction of the Mustavaara iron-vanadium mine in Taivalkoski parish was continued by Rautaruukki Oy. About 70,000 tons of rock were excavated in 1974. The open pit mine is expected to provide about 3,000 tons of vanadium pentoxide and 200,000 tons of pelletized iron concentrate per year after production begins in 1976.

A record output of vanadium pentoxide was realized at the Otanmäki mine in 1974. Exports during the year totaled 2,681 tons valued at $9.5 million. Ore reserves at Otanmäki were reportedly sufficient for at least another 20 years of operations.[8]

## NONMETALS

**Asbestos.**—Production and exports of asbestos continued to decline in 1974. The Paakkila mine, owned by Paraisten Kalkkivuori Oy., produced 188,000 tons of crude ore in 1974; this yielded 8,550 tons of usable ore and 5,593 tons of anthophyllite asbestos. Exports in 1974 totaled 4,867 tons valued at $625,000; imports totaled 6,172 tons valued at $1.4 million.

**Cement and Other Construction Materials.**—The construction industry was busy in 1974. More buildings were completed than in any previous year. Compared with 1973, the volume of industrial buildings completed was up 32% and the number of residential completions was up about 17%. Construction activity was expected to slacken in 1975, but abolition of the investment tax at the beginning of 1975 may stimulate construction of several projects that had been deferred.

A record tonnage of cement was produced in 1974. Exports declined to 66,000 tons, 62% less than the quantity exported in 1973. Imports of cement totaled 85,000 tons, slightly less than in 1973. Output of bricks and window glass, while not at record levels, was appreciably higher than in 1973. Kemira Oy. reportedly produces about 600,000 tons per year of byproduct gypsum[9] from the manufacture of phosphoric acid. The company was building a plant at its Uusikaupunki works to process some of the gypsum into 7-centimeter blocks at the rate of 35,000 tons per year. Markets for most of this material have not yet been developed since imports of gypsum in 1974 totaled nearly 185,000 tons and exports were negligible.

**Fertilizer Materials.**—With rising prices of phosphate rock and the prospect of imports of apatite from the Soviet Union being discontinued by 1980,[10] exploration

[6] Metal Bulletin Monthly. May 1975, p. 63.
[7] Rautaruukki Oy. Annual Report for 1974. P. 3.
[8] Page 8 of work cited in footnote 7.
[9] Metal Bulletin Monthly. December 1974, p. 43.
[10] Industrial Minerals (London). No. 87, December 1974, p. 43.

and beneficiation testing of phosphate deposits in central and northern Finland was continued in 1974. In both areas, phosphate is found in carbonatite complexes. At the Sokli deposit in the Savukoski area of Lapland, drilling by Rautaruukki Oy. by yearend had proved the existence of 100 million tons of material containing 6% to 9% $P_2O_5$, along with unspecified quantities of columbium and rare-earth oxides. Work was begun on development of a suitable concentration process, and deeper drilling was planned. In the Siilinjärvi area of east-central Finland, subsidiaries of Kemira Oy. were reported to have outlined deposits of fluorapatite in an area 15 kilometers long and 100 to 600 meters wide. The deposits apparently contain an average of about 10% apatite. The fluorapatite was reported to contain 40% $P_2O_5$, 56% CaO, 1.2% SrO, and 0.4% rare-earth oxides. Kemira Oy. planned to mine 100,000 tons of the material for pilot plant tests. If results are favorable, mining could begin by 1978.

Production of manufactured fertilizers set a new record in 1974. Imports of crude phosphate (570,000 tons) and potassium salts (286,000 tons) in 1974 were valued at $38 million.

**Pyrite and Sulfur.**—A drop of about 9% in mine output of pyrite and pyrrhotite in 1974 was accompanied by a decline of nearly 19% in production of elemental sulfur, compared with 1973. Exports of sulfur in 1974 declined about 35% to 20,200 tons, and imports increased to 36,500 tons.

Output of sulfuric acid in 1974 was the second highest on record. Exports (57,200 tons) were less than in 1972 or 1973, probably because of increased domestic demand.

A large increase in production capacity for sulfuric acid was planned by Kemira Oy. The company's plant at Kokkola was being expanded in 1974 to a capacity of 900,000 tons per year (present capacity, 540,000 tons), and capacity at Harjavalta was being raised to 420,000 tons per year (present capacity, 250,000 tons). Much of the increase in capacity was to be installed by mid-1975. At both localities manufacture of acid is based on smelter gases obtained from Outokumpu Oy.

## MINERAL FUELS

**Coal and Coke.**—Imports of solid fuels in 1974 included 3.93 million tons of coal and 979,000 tons of coke, having an aggregate value of $181 million. Compared with 1973, the quantities of coal and coke were up 32% and 17%, respectively, and the aggregate value more than doubled.

Consumption of coal and coke in Finland in 1973 and 1974 was as follows, in thousand metric tons:

| Consuming sector | 1973 | 1974 |
|---|---|---|
| Coal: | | |
| Electric power generation | 1,658 | 1,785 |
| Paper and woodworking industry | 623 | 578 |
| Other industries | 560 | 545 |
| Gas and coke manufacturing | 84 | -- |
| Space heating | 198 | 135 |
| Locomotive fuel | 20 | 14 |
| Total | 3,143 | 3,057 |
| Coke: | | |
| Metal reduction | 835 | 888 |
| Other | 25 | 15 |
| Total | 860 | 903 |

Source: Ministry of Commerce and Industry, through U.S. Embassy, Helsinki (State Department Airgram A-109, June 4, 1975).

**Natural Gas.**—Imports of natural gas through the Imatra-Kouvola segment of the pipeline from the Soviet Union began in January 1974. By yearend a total of 412 million cubic meters had been received, valued at approximately $27 million. Deliveries of natural gas to Finnish consumers are scheduled to increase to 1 billion cubic meters in 1975, and to 1.4 billion cubic meters in 1979.

**Peat.**—With the high cost of imported fuels, Finnish resources of peat were receiving increased attention as a national energy source. It was possible that about 10% of domestic energy requirements could be supplied by peat by 1980. In 1972, peat accounted for less than 1% of the country's energy needs.

**Petroleum.**—Imports of crude oil (including topped crude) in 1974 totaled 9.47 million tons valued at $824 million. The Soviet Union continued to be the major supplier with 63% of the total. The total quantity of crude oil imported in 1974

was slightly less than in 1973, but the total value was nearly three times greater. With net imports of 4.2 million tons of petroleum products adding another $374 million, the cost of petroleum fuels reached $1.2 billion in 1974 and accounted for a rising share of Finland's deficit in international trade.

A 5-year trade agreement between Finland and the Soviet Union was signed in September 1974. Under the agreement, Finland's import quota for crude oil in 1976–80 is 6.5 million tons per year, and the annual quota for imports of fuel oils will be 2.3 million to 3.5 million tons per year.

Total crude oil throughput in the country's two refineries in 1974 was 9.3 million tons, of which two-thirds was processed at Porvoo and the remainder at Naantali. Both refineries are owned and operated by Neste Oy. The company was increasing refining capacity at Porvoo by 5 million tons per year; this project was scheduled for completion by yearend 1975, at which time the combined refining capacity of the two plants will be between 14 million and 15 million tons per year.

Consumption of refined products in Finland was less than in 1973, due mainly to a relatively mild winter. The increased output of hydroelectric power during the year was estimated by Neste Oy. to have reduced the need for imported energy by about 500,000 tons of oil equivalent.

Inland consumption of petroleum products in 1973 and 1974 was as follows, in thousand tons:

| Refinery product | 1973 | 1974 |
|---|---|---|
| Aviation fuel | 157 | 172 |
| Gasoline | 1,244 | 1,180 |
| Kerosine | 28 | 15 |
| Gas and diesel oil | 4,577 | 4,045 |
| Residual fuel oil | 5,704 | 4,552 |
| Other | 804 | 723 |
| Total | 12,509 | 10,687 |

Source: Organization for Economic Cooperation and Development (OECD), Paris. Provisional Oil Statistics by Quarters. 4th Quarter 1974, 1975, pp. 16–21.

**Electric Energy.**—Production of electric power in 1974 was 17% more than in 1973. Total output was 29 billion kilowatt-hours, of which hydroelectric plants supplied 42%.

Under an energy agreement negotiated in 1974, the Soviet Union would guarantee delivery of electric power to Finland of up to 4 billion kilowatt-hours per year by 1980, and up to 8 billion kilowatt-hours per year after 1985.

Construction of the two 440-megawatt nuclear powerplants near Loviisa was continued in 1974. The plants were scheduled to begin service in 1976 and 1978. At the same locality, construction of two more powerplants of the same type was planned for completion by 1983.

# The Mineral Industry of France

By E. Shekarchi [1]

Despite soaring inflation, rising unemployment, bankruptcies, and a severe petroleum shortage, the French mineral industry continued to gain on West Germany, and was an economic pace setter in 1974. Instrumental in achieving this remarkable growth was the number of foreign manufacturing plants lured to France by lenient governmental policies toward foreign companies. The French economy grew at a 4.5% rate during the year, with unparalled increases in crude steel and aluminum production of 5%, compared with that of 1973, and a decrease of 4.6% in oil products consumption. The gross national product (GNP) at 1974 prices was $287.7 billion [2] compared with $248.6 billion in 1973. Estimated per capita GNP was $5,500 in 1974 compared with $4,800 in 1973.

The Government of France in 1974 made a series of policy decisions in an effort to improve the status of mineral supplies in France. The decisions reflected the results of interministerial studies which indicated that the mineral supply of France could become critical under one or another set of eventualities. Price changes and other developments in 1973 and 1974 finally overcame years of opposition, mainly from the Ministry of France, and allowed the French Government to build a national minerals stockpile. The new policy was to establish a stock of minerals equivalent to 2 months' average imports for each category of raw or processed minerals. An appropriation of approximately $23 million was approved for 1975 purchases. It was expected that this amount would be doubled in 1976 and remain at that level for 4 years. Stockpile purchases were to be made by the Groupement d'Importation et de Repartition des Métaux (GIRM), a private consortium of copper importers which was to broaden its activities under Government supervision and receive fees for services rendered. The stockpile of materials was to be maintained at Government expense and was to be disposed of only under authorization by the Government of France. According to Ministry of Industry officials, the Government was not to attempt to use the stockpile material to intervene in the market place.

Under another decision the Government would appropriate $10 million in 1975 and $25 million annually thereafter to stimulate mineral prospecting in France and to revise the mining code so as to improve the economic conditions for mineral exploitation.

A new office created in the Ministry of Industry and Scientific Research to promote recycling of metals was expected to help alleviate France's dependence on imports. To this end, a recycling program was under study and was to be presented to parliament in 1975.

Finally, since 65% of French mineral imports originate in developing countries, the Council of Ministry emphasized the necessity for continuous good relations with these nations and sought areas of cooperation in geological research, manpower training, and eventually exploitation of mineral deposits.

In March 1974, 3 months after being linked to Electricité de France, France's power system, the first neutron breeder reactor, Phénix, attained its maximum output. By the end of 1974, it produced more than 1 billion kilowatt hours. France thus confirmed her place as the world

[1] Physical scientist, Division of Ferrous Metals.
[2] Where necessary, values have been converted from French francs (F) to U.S. dollars at the rate of F4.4=US$1.00.

leader in a technique that made it possible to use nuclear fuels with an efficiency 100 times greater than conventional reactors. The success of the Phénix could be regarded as a success for Europe. France, in cooperation with Italy and West Germany, was drawing plans for commercial fast-neutron reactors of 1.2 million kilowatts, to be installed in Savoie. The construction was scheduled for early 1975.

After experiencing a period of relative stagnation in the early 1960's, the French merchant marine fleet entered a period of expansion, with its tonnage growing at an average annual rate of 10%. It was expected to double again between 1974 and 1980. This doubling of tonnage was also accompanied by far reaching changes. For example the average age of ships fell from 9½ years in 1966 to 7 years in 1974, and the number of ships dropped from 640 to 480 in the same period.

Société Nationale des Poudres et Explosifs (SNPE), a company founded in 1971, decentralized its organizational framework into four operational departments: Powders and explosives, chemicals, engineering, and rocket propulsion. SNPE had a considerable industrial potential with eight plants which manufactured a widely diversified range of products and was particularly well equipped with research centers.

To strengthen the chemical industry, several ownership changes took place during 1974. Plans called for Rhône-Poulenc S.A., Péchiney Ugine Kuhlmann (PUK), and Société Chimique des Charbonnages (Cdf-Chimie) to realign ownership in some jointly held subsidiaries. In one change, PUK's chemical division, Produits Chimiques Ugine Kuhlmann (PCUK), relinquished its 50% share of acrylonitrile products to Cdf-Chimie, which became 100% owner. PCUK retained ownership of a 45,000-ton-per-year plant at Yvours. In other deals, PCUK gained full ownership of a plastics maker, which was jointly owned with Rhône-Poulenc obtained PCUK's interest and full ownership in three downstream plastic makers. In another action Entreprise Minière et Chimique (EMC) and Cdf-Chimie were to join in building a vinyl chloride monomer and polyvinyl chloride (PVC) complex in the Alsace region. Also EMC was to buy 50% of the PVC plant that Cdf-Chimie was to bring onstream at Mazingarhe at yearend 1975. Both companies also planned to construct a 10,000-ton-per-year benzyl chloride unit and coordinate ammonium and phosphate output.

The Délégation à l'Aménagement du Territoire et à l'Action Régionale (DATAR), celebrated its tenth anniversary in 1974. DATAR acts as a special adviser to the Prime Minister and as a coordinator of ministerial policies in the provinces. In drafting the fifth plan DATAR invited France's local authorities to participate and have an active voice in implementing it. The Government was also elaborating on its foreign investment policy. Foreign investment was welcomed as long as it produced jobs, brought in technologic know-how, and was not solely financial. If investors set up new industries in areas chosen by DATAR, they benefited, particularly foreign investors, with special premiums up to 25%. DATAR opened up branch offices in many major cities of industrialized nations, to inform investors of local attractions as well as investment opportunities in France.

French chemical processing companies and metal companies took an active role in combating pollution, in response to French Government demands in 1974. A draft agreement was negotiated between the French Government and PUK, which required the company to spend about $240 million for pollution control at its plants, during the next 5 years. PUK, France's largest private company, was to spend about $26 million in remodeling the Lannemezan aluminum plant alone by 1976.

The Bureau de Recherches Géologiques et Minières (BRGM), a combined industrial, commercial, and government organization, was granted a permit by the Ministry of Industry to prospect for copper, zinc, silver, and allied metals at Couesnou. Also, the Ministry extended BRGM's permit for prospecting at Saint-Salvy and authorized development work on behalf of Société Minière et Métallurgique de Peñarroya S.A. BRGM was budgeted about 50% by the Government, 48% by private companies for which BRGM performed all aspects of mining and geological work at home and abroad, and 2% from BRGM's investments as a company. In addition to immediate financing for France's long anticipated stock-

piling program, the Government was to double the current budget of BRGM to accelerate geological research and resource inventories within the country and overseas territories.

## PRODUCTION AND TRADE

Table 1 gives the production of primary minerals and processed metals and nonmetals.

Details of foreign trade including total tonnage by commodities are given in tables 2 and 3.

**Table 1.—France: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite, gross weight ---- thousand tons | r 3,402 | 3,299 | 2,938 |
| Alumina ---- do | 1,274 | 1,268 | 1,280 |
| Metal: | | | |
| Primary ---- do | 394 | 359 | 393 |
| Secondary ---- do | 112 | 124 | 125 |
| Antimony, smelter production | 2,090 | 2,355 | 3,117 |
| Arsenic, white | 6,932 | r e 7,000 | e 7,000 |
| Bismuth: | | | |
| Ore and concentrate, metal content ---- kilograms | 80,000 | e 70,000 | e 70,000 |
| Metal ---- do | 67,000 | 57,000 | 57,000 |
| Cadmium metal | 572 | 606 | 644 |
| Cobalt metal | r 700 | 835 | 885 |
| Copper: | | | |
| Mine output, metal content | 472 | 414 | 392 |
| Metal: | | | |
| Blister (secondary) | 8,340 | 8,784 | 9,298 |
| Refined [1] | 15,600 | 21,600 | 22,558 |
| Gold: | | | |
| Mine output, metal content ---- troy ounces | r 58,386 | 86,614 | 48,901 |
| Metal [e] ---- do | 58,000 | 86,000 | 48,000 |
| Iron and steel: | | | |
| Iron ore and concentrate: | | | |
| Gross weight ---- thousand tons | r 54,246 | 54,232 | 54,260 |
| Metal content ---- do | 16,525 | 15,671 | 16,714 |
| Pig iron ---- do | 18,551 | 19,760 | 21,986 |
| Ferroalloys: | | | |
| Blast furnace ---- do | r 466 | 544 | 533 |
| Electric furnace ---- do | 355 | 421 | 452 |
| Steel: | | | |
| Ingots and castings ---- do | 24,054 | 25,264 | 27,023 |
| Semimanufactures ---- do | 19,481 | 20,190 | 21,896 |
| Lead: | | | |
| Mine output, metal content | r 25,294 | 23,732 | 20,789 |
| Metal, refined: | | | |
| Primary | 136,133 | 128,075 | 124,305 |
| Secondary | 17,261 | 19,819 | 17,240 |
| Antimonial lead (lead content) | 33,459 | 38,516 | 36,193 |
| Total | 186,853 | 186,410 | 177,738 |
| Magnesium metal including secondary | r 6,849 | 6,994 | 6,531 |
| Nickel, metal content of metallurgical products (pure nickel, ferronickel, and nickel oxide) | 13,072 | 10,435 | 9,512 |
| Silicon | 31,580 | 37,770 | 41,370 |
| Silver: | | | |
| Mine output, metal content ---- thousand troy ounces | r 2,084 | 1,656 | 1,521 |
| Metal (content of final smelter products) ---- do | 4,210 | 4,176 | 3,462 |
| Tin concentrate, metal content ---- long tons | 308 | 251 | 140 |
| Tungsten concentrate, metal content | r 566 | 702 | 593 |
| Uranium: | | | |
| Mine output, uranium content | 1,440 | 1,644 | 1,630 |
| Chemical concentrate, uranium content | r 1,383 | 1,515 | 1,608 |
| Zinc: | | | |
| Mine output, metal content | r 11,851 | 13,335 | 14,261 |
| Metal including secondary: | | | |
| Slab | r 256,610 | 257,810 | 276,520 |
| Dust | r 9,260 | 9,310 | 9,670 |

See footnotes at end of table.

## Table 1.—France: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **NONMETALS** | | | |
| Alabaster | 1,870 | NA | NA |
| Barite | r 116,393 | 110,000 | 105,000 |
| Bromine, elemental | 13,560 | 16,640 | 15,880 |
| Cement, hydraulic thousand tons | r 29,913 | 30,588 | 32,340 |
| Clays: | | | |
| Bentonite [2] | 14,025 | r e 14,000 | e 14,000 |
| Brick and tile clay thousand tons | 9,781 | NA | NA |
| Ceramic and pottery clay | 594,070 | NA | NA |
| Clay and marl for cement industry thousand tons | 14,260 | NA | NA |
| Kaolin and kaolinite clay, crude | 583,764 | r e 590,000 | e 590,000 |
| Refractory clay thousand tons | 1,076 | NA | NA |
| Diatomite | 197,098 | e 200,000 | e 210,000 |
| Feldspar: | | | |
| Crude | r 224,000 | 229,000 | 241,000 |
| Marketable [3] | 225,997 | r e 225,000 | e 225,000 |
| Fertilizer materials: | | | |
| Crude (natural): | | | |
| Phosphatic chalk | r 31,686 | 29,000 | 40,000 |
| Potash: | | | |
| Gross weight thousand tons | 10,606 | 13,247 | 13,362 |
| $K_2O$ equivalent do | 1,760 | 2,263 | 2,275 |
| $K_2O$ equivalent (marketable) do | 1,624 | 2,067 | 2,083 |
| Manufactured: | | | |
| Nitrogenous, nitrogen content do | r 1,541 | 1,730 | 1,898 |
| Phosphatic: | | | |
| Superphosphate, gross weight do | r 1,287 | 1,244 | 1,262 |
| Thomas slag do | 2,557 | 2,584 | 2,915 |
| Other do | 1,840 | 2,038 | 2,173 |
| Potassic do | 1,620 | 2,039 | NA |
| Mixed, gross weight do | r 7,879 | 8,581 | 8,926 |
| Ammonia do | 1,770 | 1,923 | 2,114 |
| Fluorspar: | | | |
| Crude | r 663,675 | 570,000 | 610,000 |
| Marketable [e] | 290,000 | r 260,000 | 270,000 |
| Fly ash thousand tons | e 4,000 | e 4,000 | NA |
| Gypsum and anhydrite, crude do | r 6,525 | 6,160 | 6,265 |
| Lime, quicklime and hydrated lime, including dead-burned dolomite do | 4,835 | 5,017 | 5,103 |
| Mica | 3,926 | r e 4,000 | e 4,000 |
| Pigments, natural mineral, iron oxides | 1,139 | NA | NA |
| Pozzolana and lapilli | r 712,456 | 719,000 | 867,000 |
| Pumice | 900 | r e 900 | e 900 |
| Pyrite, gross weight thousand tons | 33 | -- | -- |
| Quartz and glass sand: | | | |
| Quartz | 631,068 | [4] 391,000 | [4] 340,000 |
| Glass sand thousand tons | 2,484 | 6,048 | 5,677 |
| Salt: | | | |
| Rock salt do | 198 | 236 | 250 |
| Brine salt do | r 566 | 1,087 | 1,148 |
| Marine salt do | r 962 | 1,268 | 1,080 |
| Salt in solution do | r 3,718 | 3,533 | 3,515 |
| Total do | r 5,444 | 6,124 | 5,993 |
| Stone, sand and gravel, n.e.s.: | | | |
| Building stone: | | | |
| Granite and similar stone do | 1,171 | | |
| Limestone do | 2,513 | | |
| Marble do | 301 | NA | NA |
| Other do | 24 | | |
| Crushed limestone and granite do | 7,717 | | |
| Dolomite: | | | |
| For agriculture | 253,787 | | NA |
| Crude for calcining | 554,900 | NA | 665,668 |
| Other | 581,200 | | NA |
| Total | 1,389,887 | NA | 665,668 |
| Limestone, agricultural and industrial: | | | |
| For agriculture thousand tons | 483 | NA | NA |
| For iron and steel industry do | 5,539 | NA | NA |
| For lime and cement do | 29,920 | NA | NA |
| For sugar mills do | 919 | 970 | 900 |
| Total do | 36,861 | 970 | 900 |

See footnotes at end of table.

## Table 1.—France: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| NONMETAL—Continued | | | | |
| Stone, sand and gravel—Continued | | | | |
| Road building, foundation and ballast (other than alluvial sand and gravel): | | | | |
| Ballast | thousand tons | 94,827 | | |
| Foundation material | do | 10,605 | | |
| Ground rock for road filler | do | 390 | NA | NA |
| Paving block and curbing | do | 203 | | |
| Slate: | | | | |
| Roof | do | 107 | 97 | 96 |
| Other | do | 52 | NA | NA |
| Other stone: | | | | |
| Beach pebble | do | 196 | | |
| Lava | do | 11 | | |
| Marl | do | 176 | NA | NA |
| Mine fill | do | 9,581 | | |
| Millstones and grindstones | | 430 | | |
| Sand and gravel: | | | | |
| Industrial sands: | | | | |
| Foundry | thousand tons | 1,969 | NA | NA |
| Miscellaneous | do | 708 | NA | NA |
| Other sand and gravel (alluvial): | | | | |
| By dredging | do | 113,945 | | |
| By other winning methods | do | 118,680 | 202,250 | 215,940 |
| Sulfur: | | | | |
| Content of pyrite | do | 18 | -- | -- |
| Byproduct: | | | | |
| From natural gas | do | 1,730 | 1,753 | 1,840 |
| From petroleum | do | 13 | 57 | e 65 |
| From unspecified sources | do | 75 | 46 | e 45 |
| Total | do | 1,831 | 1,856 | 1,950 |
| Talc: | | | | |
| Crude | | 268,400 | 225,120 | 309,080 |
| Powder | | 236,075 | 257,811 | 298,335 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Asphaltic material [5] | | 115,883 | 117,561 | 116,166 |
| Carbon black | | 158,630 | e 160,000 | e 160,000 |
| Coal: | | | | |
| Anthracite | thousand tons | 8,485 | 7,091 | 5,950 |
| Bituminous | do | 21,278 | 18,590 | 16,946 |
| Lignite | do | 2,962 | 2,764 | 2,759 |
| Total | do | 32,725 | 28,445 | 25,655 |
| Briquets | do | r 3,353 | 3,284 | 3,399 |
| Coke, metallurgical | do | r 11,548 | 11,881 | 12,282 |
| Gas, natural: | | | | |
| Gross production | million cubic feet | 386,694 | 387,753 | 392,711 |
| Marketed | do | 260,374 | 261,680 | 269,393 |
| Natural gas liquids: | | | | |
| Natural gasoline | thousand 42-gallon barrels | 3,112 | 3,363 | 3,800 |
| Propane | do | 1,729 | 1,739 | 1,751 |
| Butane | do | 1,893 | 1,750 | 1,814 |
| Total | do | 6,734 | 6,852 | 7,365 |
| Peat | thousand tons | 109 | 153 | e 155 |
| Petroleum: | | | | |
| Crude | thousand 42-gallon barrels | r 10,814 | 9,138 | 7,864 |
| Refinery products: | | | | |
| Gasoline: | | | | |
| Aviation | do | 368 | 403 | 394 |
| Motor | do | 132,456 | 142,995 | 142,238 |
| Jet fuel | do | 24,972 | 26,709 | 25,937 |
| Kerosine | do | 532 | 284 | 348 |
| Distillate fuel oil | do | 320,690 | 357,753 | 337,067 |
| Residual fuel oil | do | 250,339 | 289,504 | 261,101 |
| Lubricants | do | 8,458 | 8,291 | 9,111 |
| Liquefied petroleum gas | do | 31,767 | 34,256 | 32,661 |
| Bitumen | do | 19,093 | 23,355 | 22,504 |
| Other | do | 29,411 | 66,220 | 77,242 |
| Refinery fuel and losses | do | 70,810 | 53,101 | 41,605 |
| Total | do | 888,896 | 1,002,871 | 950,208 |

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Data represent imported anode and blister portions of total electrolytic copper produced.

[2] Including smectic clay.

[3] Reportedly includes pegmatite.

[4] Data represents quantity for ceramic industry only.

[5] Excludes bituminous material.

## Table 2.—France: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite | 85,848 | 55,242 | West Germany 44,337; Switzerland 6,000. |
| Oxide and hydroxide[1] | 383,997 | 408,341 | Spain 139,264; Italy 122,916; Netherlands 62,049. |
| Metal including alloys: | | | |
| Scrap | 24,664 | 21,687 | Italy 13,112; West Germany 4,125; Belgium-Luxembourg 3,983. |
| Unwrought | 165,442 | 183,633 | Italy 43,738; West Germany 41,339; Belgium-Luxembourg 31,739. |
| Semimanufactures | 121,444 | 135,805 | United States 10,097. |
| Antimony metal including scrap | 112 | 217 | Italy 82. |
| Arsenic (anhydride) | 8,887 | 9,543 | United Kingdom 908. |
| Beryllium value, thousands[2] | r $96 | $173 | United States $138. |
| Bismuth, all forms | 243 | 229 | Italy 162; Belgium-Luxembourg 34. |
| Cadmium | 135 | 132 | Belgium-Luxembourg 55; West Germany 51. |
| Chromium: | | | |
| Chromite | 325 | 207 | NA. |
| Oxide and hydroxide | 217 | 58 | NA. |
| Metal | 458 | 440 | United States 145; West Germany 131; Italy 57. |
| Cobalt | 465 | 456 | United States 68; Austria 55; West Germany 50. |
| Columbium (niobium), all forms value, thousands[2] | r $14 | $3 | NA. |
| Copper: | | | |
| Matte | 358 | 1,112 | Belgium-Luxembourg 256; West Germany 229; United Kingdom 228. |
| Metal and alloys: | | | |
| Scrap | 57,863 | 75,171 | West Germany 25,693; Belgium-Luxembourg 25,350; Italy 16,614. |
| Blister and other unrefined | 6,334 | 6,835 | Mainly to Belgium-Luxembourg. |
| Refined | 3,805 | 8,603 | West Germany 3,071; Netherlands 1,753; Italy 1,458. |
| Semimanufactures | 72,528 | 83,770 | West Germany 33,134; Netherlands 12,286; United States 8,998. |
| Gallium[3] value, thousands[2] | $1,276 | $1,931 | Switzerland $1,878. |
| Gold: | | | |
| Ashes and sweepings kilograms | 773 | 147 | Switzerland 108. |
| Metal: | | | |
| For domestic use thousand troy ounces | 297 | 487 | New Caledonia 161; Netherlands 75. |
| Temporary imports do | 4,006 | 3,858 | Switzerland 1,726; Dubai 860. |
| Iron and steel: | | | |
| Iron ore thousand tons | 19,072 | 19,454 | Belgium-Luxembourg 15,889; West Germany 3,565. |
| Pyrite cinder do | 120 | 109 | Mainly to Belgium-Luxembourg. |
| Metal: | | | |
| Scrap do | 3,081 | 2,788 | Italy 2,187; Belgium-Luxembourg 317. |
| Pig iron including spiegeleisen[4] do | 111 | 187 | Belgium-Luxembourg 68; Italy 60; West Germany 41. |
| Ferroalloys do | 451 | 575 | United States 170; West Germany 144; Italy 101. |
| Shot and powder do | 27 | 28 | West Germany 12; Italy 6. |
| Steel: | | | |
| Primary forms including coil do | 974 | 914 | Italy 295; Belgium-Luxembourg 222; West Germany 142. |
| Semimanufactures: | | | |
| Bars, rods, wire rods and sections do | 2,935 | 3,009 | West Germany 602; United States 472; Belgium-Luxembourg 309. |
| Plates, sheets, universals do | 3,067 | 3,012 | West Germany 781; United States 345; Italy 324. |
| Hoop and strip do | 381 | 486 | West Germany 144; Belgium-Luxembourg 86; Italy 83. |
| Rails and accessories do | 258 | 185 | Italy 48; Egypt 25. |
| Wire do | r 116 | 141 | West Germany 36; United States 26; Belgium-Luxembourg 16. |
| Tubes, pipes, fittings do | 892 | 1,056 | U.S.S.R. 252; Netherlands 137. |
| Castings and forgings, rough do | 31 | 49 | Belgium-Luxembourg 18; United States 17; West Germany 6. |

See footnotes at end of table.

## Table 2.—France: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Lead: | | | |
| Ore | 95 | 105 | NA. |
| Oxides | 12,332 | 15,938 | Italy 5,568; Netherlands 3,430; U.S.S.R. 1,500. |
| Metal including alloys: | | | |
| Scrap | 14,140 | 18,503 | Italy 7,526; West Germany 6,420; Netherlands 3,958. |
| Unwrought | 19,222 | 24,833 | West Germany 7,376; Greece 4,656; Belgium-Luxembourg 3,978. |
| Semimanufactures | r 4,420 | 2,494 | Italy 326; Belgium-Luxembourg 284. |
| Magnesium metal including alloys, all forms | 3,560 | 4,278 | West Germany 3,395. |
| Manganese: | | | |
| Ore | 3,827 | 9,923 | Spain 5,795; Greece 2,000. |
| Oxide | 121 | 708 | Ivory Coast 311. |
| Metal including alloys, all forms | 5,023 | 6,558 | Italy 1,501; West Germany 1,350; Sweden 1,301. |
| Mercury 76-pound flasks | 290 | 145 | NA. |
| Molybdenum: | | | |
| Ore | 6 | 11 | NA. |
| Oxide | 33 | 117 | Belgium-Luxembourg 74; Netherlands 24. |
| Metal, all forms | 80 | 97 | Netherlands 47; West Germany 26; Italy 10. |
| Nickel: | | | |
| Matte, speiss, etc | 325 | 554 | Czechoslovakia 430. |
| Oxides | 257 | 606 | Italy 163; United States 126; Belgium-Luxembourg 61. |
| Metal including alloys: | | | |
| Scrap | 2,508 | 2,278 | West Germany 848; Netherlands 410; United Kingdom 325. |
| Ingots | 5,767 | 3,824 | West Germany 1,383; Sweden 390; Yugoslavia 388. |
| Semimanufactures, including anodes | 3,572 | 3,997 | Spain 1,291; West Germany 556. |
| Platinum and platinum-group metals, including alloys thousand troy ounces | r 380 | 63 | West Germany 21; Netherlands 16; Spain 11. |
| Selenium | 11 | 8 | NA. |
| Silver: | | | |
| Metal including alloys thousand troy ounces | 11,722 | 21,594 | Spain 6,219; Sweden 4,285; West Germany 2,478. |
| Ashes and sweepings do | r 2,614 | 94 | Mainly to United Kingdom. |
| Tantalum, all forms value, thousands [2] | $161 | $144 | United States $81. |
| Thorium oxide | 11 | 44 | United Kingdom 18; Japan 11, Belgium-Luxembourg 9. |
| Tin: | | | |
| Ore long tons | 443 | 413 | All to Spain. |
| Oxide do | 40 | 41 | West Germany 38. |
| Metal including alloys: | | | |
| Scrap do | 41 | 70 | West Germany 28. |
| Ingots do | 282 | 242 | Italy 107; Switzerland 33. |
| Semimanufactures do | 156 | 212 | Belgium-Luxembourg 24. |
| Titanium: | | | |
| Ore | 336 | 222 | NA. |
| Oxide | 20,895 | 21,161 | United States 5,376. |
| Metal, all forms | 400 | 364 | United Kingdom 120; Italy 88; West Germany 53. |
| Tungsten: | | | |
| Ore | 1,402 | 1,260 | West Germany 1,050; United States 209. |
| Trioxide | 89 | 66 | Austria 31; West Germany 24; Yugoslavia 6. |
| Metal, all forms | 237 | 333 | West Germany 95; Japan 52. |
| Zinc: | | | |
| Ore | 2,687 | 9,045 | Italy 6,318; Belgium-Luxembourg 1,457; West Germany 1,270. |
| Matte | 241 | 40 | NA. |
| Oxide | 80 | 20,363 | United States 4,070; Belgium-Luxembourg 3,786; Netherlands 3,722. |
| Metal including alloys: | | | |
| Scrap | 1,698 | 2,294 | Italy 1,551; West Germany 346; Belgium-Luxembourg 316. |
| Dust (blue powder) | 2,848 | 4,043 | Norway 2,226; Belgium-Luxembourg 485; Spain 451. |
| Slab and ingot | 48,160 | 40,030 | United States 12,919; West Germany 5,532; Switzerland 4,150. |
| Semimanufactures | 17,712 | 24,583 | West Germany 10,488; Belgium-Luxembourg 7,584. |

See footnotes at end of table.

## Table 2.—France: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Zirconium: | | | |
| Ore | 81 | 563 | Italy 438. |
| Oxide | 77 | [3] 144 | Netherlands 46; Spain 36; West Germany 22. |
| Metal including nuclear grade | 146 | 169 | Sweden 64; United States 54. |
| Other: | | | |
| Ore and concentrate | 1,290 | 118 | NA. |
| Ash and residues from nonferrous metals: | | | |
| Aluminum | 6,608 | 7,106 | Italy 4,896; West Germany 1,267; Belgium-Luxembourg 921. |
| Copper | 3,013 | 12,339 | Belgium-Luxembourg 10,206; West Germany 1,361. |
| Lead | 8,070 | 8,596 | Belgium-Luxembourg 8,349. |
| Nickel | 589 | 468 | Netherlands 120; Belgium-Luxembourg 85; Italy 65. |
| Zinc | 7,107 | 14,507 | Belgium-Luxembourg 7,394; West Germany 3,311; Netherlands 1,549. |
| Other | 36,181 | 25,088 | Sweden 14,210; Belgium-Luxembourg 6,066; West Germany 4,116. |
| Ashes, sweepings and other residues of platinum, silver, and other precious metals | 115 | 5 | United Kingdom 3. |
| Slag and ash, n.e.s | 37,337 | 37,129 | Belgium-Luxembourg 15,759; Ivory Coast 14,855. |
| Metal including alloys, all forms [5] | r 607 | 344 | West Germany 99; Yugoslavia 83; Belgium-Luxembourg 51. |
| NONMETALS | | | |
| Abrasives, natural: | | | |
| Pumice, emery and other | 642 | 689 | Algeria 246. |
| Dust and powder of precious and semiprecious stones value thousands [2] | $293 | $463 | Spain $271; Switzerland $116. |
| Grinding and polishing wheels | 2,933 | 3,586 | West Germany 631; Belgium-Luxembourg 488; Italy 386. |
| Asbestos, crude | 5,715 | 2,694 | West Germany 1,929. |
| Barite, including witherite | 26,421 | 16,649 | Belgium-Luxembourg 3,601; Italy 2,202; Gabon 1,890. |
| Borates, natural | 476 | 2,852 | West Germany 2,311. |
| Cement thousand tons | 1,890 | 2,429 | Ivory Coast 510; West Germany 320; United States 300. |
| Chalk | 397,826 | 454,952 | West Germany 200,364; Belgium-Luxembourg 77,996; Netherlands 50,772. |
| Clays and clay products (including all refractory brick): | | | |
| Crude: | | | |
| Kaolin | 103,362 | 91,781 | West Germany 56,410; Italy 18,438. |
| Bentonite | 2,416 | 1,937 | NA. |
| Refractory | 362,174 | 403 | NA. |
| Other | 134,655 | 507,362 | Italy 269,800; West Germany 109,602; Belgium-Luxembourg 44,509. |
| Products: Refractory (including nonclay bricks) | 403,354 | 473,093 | West Germany 181,276; Belgium-Luxembourg 91,914. |
| Corundum: | | | |
| Natural including emery (included in abrasives above) | 279 | 412 | Algeria 246. |
| Artificial | 15,456 | 19,465 | Belgium-Luxembourg 2,853; Italy 2,697; Austria 2,659. |
| Cryolite and chiolite, natural | 95 | 24 | NA. |
| Diamond: | | | |
| Industrial excluding powder value, thousands [2] | $2,351 | $1,361 | Ireland $487; Belgium-Luxembourg $287; Spain $132. |
| Gem, unset do | r $10,764 | $13,753 | Switzerland $6,246; Netherlands $2,731 United States $2,184. |
| Diatomite | 17,016 | 16,297 | West Germany 8,783; Italy 1,548. |
| Feldspar | 37,597 | 43,104 | Belgium Luxembourg 19,934; Spain 8,408; West Germany 6,934. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous (natural sodium nitrates) | 1,011 | 5 | NA. |
| Phosphate rock | 3,494 | 2,406 | NA. |
| Potassic salts | 36,778 | 32,566 | Belgium-Luxembourg 25,719; Netherlands 4,353. |
| Organic | 23,954 | 24,194 | Switzerland 16,019; West Germany 2,421. |

See footnotes at end of table.

## Table 2.—France: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials—Continued | | | |
| Manufactured: | | | |
| Nitrogenous - thousand tons | 546 | 540 | Belgium-Luxembourg 99; Morocco 72; Egypt 60. |
| Phosphatic: | | | |
| Basic slag do | 318 | 239 | Switzerland 113; Austria 71; Italy 46. |
| Other do | 43 | 68 | Bulgaria 11; Poland 11; United Kingdom 10. |
| Potassic do | 678 | 700 | Belgium-Luxembourg 255; Italy 114. |
| Ammonia, anhydrous | 135 | 176 | West Germany 96; Spain 28. |
| Flint (pebbles) | 109,767 | 820,552 | West Germany 733,130. |
| Fluorspar | 75,163 | 122,828 | West Germany 85,205; Italy 16,286. |
| Graphite | 2,132 | 1,606 | Spain 535; Belgium-Luxembourg 231. |
| Gypsum and anhydrite, including plasters thousand tons | 1,192 | 1,243 | Belgium-Luxembourg 438; Denmark 150; Norway 148. |
| Iodine | 42 | 11 | NA. |
| Lime | 375,997 | 371,958 | West Germany 161,460; Belgium-Luxembourg 157,916. |
| Magnesite, including calcined | 373 | 719 | NA. |
| Mica | 1,395 | 1,861 | West Germany 715; United Kingdom 622; Belgium-Luxembourg 220. |
| Pigments, mineral, including iron oxide | 2,948 | 2,323 | NA. |
| Pozzolan, santorin, etc | 3,185 | 20,170 | Ivory Coast 16,957. |
| Precious and semiprecious stones, except diamond[6] value, thousands[2] | r $16,816 | $19,751 | Switzerland $11,715. |
| Pyrite, gross weight | NA | 1,626 | NA. |
| Salt | 103,788 | 158,755 | West Germany 96,658; Belgium-Luxembourg 22,202; Spain 16,660. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 317,058 | 503,778 | Guinea 94,754; United States 80,518; Australia 78,485. |
| Stone, sand and gravel:[7] | | | |
| Building stone: | | | |
| Crude and partly worked, n.e.s | 93,618 | 99,792 | Belgium-Luxembourg 55,855; West Germany 16,615; Switzerland 14,360. |
| Worked: | | | |
| Slate, including crude | 28,903 | 39,057 | Netherlands 17,873; Belgium-Luxembourg 15,196. |
| Not specified | 14,583 | 13,891 | Belgium-Luxembourg 6,130; West Germany 5,285. |
| Dolomite, chiefly refractory grade | 79,893 | 88,937 | Belgium-Luxembourg 33,716; West Germany 16,993; Liberia 16,386. |
| Gravel and crushed stone thousand tons | 12,305 | 13,747 | West Germany 10,708; Switzerland 1,913. |
| Limestone (except dimension) | 165,222 | 247,143 | West Germany 100,286; Belgium-Luxembourg 86,706; Switzerland 59,323. |
| Quartz and quartzite | 3,678 | 5,374 | Belgium-Luxembourg 3,989. |
| Sand, excluding metal bearing thousand tons | 8,825 | 4,275 | West Germany 2,372; Sweden 1,126. |
| Sulfur, elemental do | 1,004 | 870 | United Kingdom 435; Netherlands 112. |
| Talc and steatite | 57,455 | 68,688 | West Germany 18,014; United Kingdom 13,761. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 225,987 | 269,971 | Switzerland 211,023. |
| Slag, dross and similar waste not metal bearing, from iron and steel manufacture thousand tons | 1,331 | 1,340 | West Germany 900; Netherlands 211. |
| Oxides and hydroxides of magnesium, strontium, and barium | 6,509 | 5,871 | West Germany 1,175. |
| Fluorine | 230 | 21 | NA. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 7,467 | 7,077 | NA. |
| Carbon black | 32,954 | 43,732 | Italy 11,903; Spain 9,572; West Germany 6,236. |
| Coal and briquets: | | | |
| Bituminous | 940,749 | 951,554 | West Germany 603,027; Belgium-Luxembourg 217,834. |
| Briquets of bituminous coal | 127,563 | 80,106 | United Kingdom 64,341; Italy 9,033. |
| Lignite | 24,137 | 29,112 | Mainly to Spain. |
| Coke | 577,335 | 918,862 | Belgium-Luxembourg 398,192; West Germany 176,587. |

See footnotes at end of table.

## Table 2.—France: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Gas, natural ____ million cubic feet | r 352,655 | 3,553 | Switzerland 2,474. |
| Hydrogen, helium, and rare gasses | 651 | 841 | Switzerland 402. |
| Peat, including briquets | 3,047 | 956 | NA. |
| Petroleum refinery products: | | | |
| Gasoline thousand 42-gallon barrels | r 22,687 | 6,100 | United Kingdom 1,469; Switzerland 1,385; Netherlands 1,381. |
| Kerosine and jet fuel ____ do | 5,776 | 5,692 | Switzerland 2,797; West Germany 1,576. |
| Distillate fuel oil ____ do | 32,357 | 32,540 | Switzerland 15,097; West Germany 9,754. |
| Residual fuel oil ____ do | 20,005 | 24,428 | West Germany 5,392; United Kingdom 3,391; Belgium-Luxembourg 3,277. |
| Lubricants ____ do | 3,838 | 2,778 | United Kingdom 570; Belgium-Luxembourg 463; Netherlands 326. |
| Other: | | | |
| Liquefied petroleum gas do | 6,030 | 7,373 | Spain 3,118; Portugal 1,289. |
| Bitumen, petroleum coke, and other residues ____ do | 2,417 | 2,375 | West Germany 1,306; Switzerland 581. |
| Chemical derivatives of coal, petroleum, or gas | 104,031 | 103,914 | West Germany 37,474. |

r Revised. NA Not available.
[1] Excludes artificial corundum.
[2] Based on exchange rates of 5.0443 francs per U.S. dollar in 1972 and 4.4540 francs per U.S. dollar in 1973.
[3] Includes indium and thallium.
[4] Including cast iron and shot, grit, powder and sponge of iron and steel.
[5] Alkali, alkaline earth and rare-earth metals except sodium.
[6] Including synthetic and reconstituted stone, but not including diamond.
[7] Not including slate, flint, or industrial limestone.

## Table 3.—France: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite | 517,905 | 587,765 | Australia 304,574; Greece 135,903; Guinea 77,702. |
| Oxide and hydroxide [1] | 9,756 | 20,583 | West Germany 14,261; United States 2,410. |
| Metal including alloys: | | | |
| Scrap | 23,089 | 30,600 | Belgium-Luxembourg 10,071; West Germany 8,695; Netherlands 3,317. |
| Unwrought | 194,126 | 229,743 | Greece 45,700; West Germany 33,983; Netherlands 31,743. |
| Semimanufactures | 109,932 | 136,112 | West Germany 60,097; Belgium-Luxembourg 36,516; Italy 13,731. |
| Antimony: | | | |
| Ore and concentrate | 4,643 | 6,286 | Thailand 2,076; Bolivia 1,068; Morocco 797. |
| Metal, all forms | 1,119 | 2,269 | People's Republic of China 860; Belgium-Luxembourg 821; Italy 289. |
| Arsenic, anhydride and acid | -- | 5 | NA. |
| Beryllium, metal, all forms value, thousands [2] | r $224 | $391 | United States $254; West Germany $97. |
| Bismuth | 1,209 | 1,146 | Bolivia 406; Peru 231; Belgium-Luxembourg 212. |
| Cadmium | 569 | 613 | Belgium-Luxembourg 204; Japan 154; Zaire 108. |
| Chromium: | | | |
| Ore | 276,393 | 330,802 | Madagascar 117,600; U.S.S.R. 92,347; United States 56,180. |
| Oxide and hydroxide | 3,189 | 2,937 | West Germany 1,421; United Kingdom 669; U.S.S.R. 396. |
| Metal, all forms | 90 | 83 | United Kingdom 48; United States 21. |

See footnotes at end of table.

## Table 3.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Cobalt: | | | |
| Ore | 7,815 | 8,499 | All from Morocco. |
| Oxide and hydroxide | 269 | 253 | All from Belgium-Luxembourg. |
| Metal, all forms | r 409 | 568 | Zaire 335; Belgium-Luxembourg 75; United States 75. |
| Columbium: | | | |
| Ore (including tantalum ore) [3] | 619 | 814 | Canada 731. |
| Metal, all forms value, thousands [2] | r $136 | $122 | United States $76. |
| Copper: | | | |
| Ore and concentrate | 4,346 | 2,958 | Mainly from Mauritania. |
| Matte | 3,580 | 1,970 | United Kingdom 1,502; West Germany 245. |
| Metal including alloys: | | | |
| Scrap | 13,279 | 13,208 | Belgium-Luxembourg 3,776; West Germany 2,243; Netherlands 1,651. |
| Blister and other unrefined | 15,713 | 18,296 | Zaire 10,026; Belgium-Luxembourg 5,999. |
| Refined | 369,725 | 381,374 | Belgium-Luxembourg 129,602; Zambia 65,782. |
| Semimanufactures | 54,846 | 79,497 | West Germany 29,983; Belgium-Luxembourg 29,416. |
| Germanium, gallium, etc. value, thousands [2] | r $434 | $502 | Belgium-Luxembourg $253. |
| Gold: | | | |
| Ash and sweepings kilograms | 23,113 | 4,376 | Canada 688. |
| Metal: | | | |
| For domestic use thousand troy ounces | 322 | 1,469 | Mainly from Netherlands. |
| Temporary imports do | 3,385 | 4,130 | Switzerland 1,762; United States 655; Lebanon 534. |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite thousand tons | 11,599 | 11,530 | Brazil 3,109; Sweden 1,966; Mauritania 1,881. |
| Roasted pyrite do | 89 | 114 | Spain 52; Italy 38; West Germany 19. |
| Metal: | | | |
| Scrap do | 239 | 436 | Belgium-Luxembourg 195; West Germany 99; United Kingdom 59. |
| Pig iron, spiegeleisen and other [4] thousand tons | 395 | 411 | West Germany 350. |
| Ferroalloys do | 146 | 157 | New Caledonia 87; West Germany 25; Belgium-Luxembourg 17. |
| Steel, primary forms do | 1,941 | 1,911 | Belgium-Luxembourg 1,063; West Germany 571. |
| Semimanufactures: | | | |
| Bars, rods, sections [5] thousand tons | 2,440 | 2,519 | Belgium-Luxembourg 1,055; West Germany 992. |
| Plates, sheets, and universals do | 2,806 | 3,229 | Belgium-Luxembourg 1,574; West Germany 893. |
| Hoop and strip do | 394 | 418 | Belgium-Luxembourg 263; West Germany 125. |
| Rails and accessories do | 85 | 88 | United Kingdom 57; Belgium-Luxembourg 23. |
| Wire do | 127 | 156 | West Germany 66; Belgium-Luxembourg 62. |
| Tubes, pipes, and fittings do | 442 | 471 | West Germany 196; Belgium-Luxembourg 72; Italy 58. |
| Castings and forgings, rough | 12,638 | 13,407 | West Germany 5,042; Switzerland 4,601; Belgium-Luxembourg 3,150. |
| Lead: | | | |
| Ore and concentrate | 159,837 | 150,422 | Ireland 52,109; Morocco 48,749. |
| Oxide | 2,826 | 3,207 | Bulgaria 999; Mexico 736; East Germany 670. |
| Metal including alloys: | | | |
| Scrap | 13,393 | 12,619 | Belgium-Luxembourg 5,383; Netherlands 4,577; Switzerland 1,506. |
| Unwrought | 41,071 | 38,815 | Belgium-Luxembourg 16,410; United Kingdom 8,890; West Germany 8,331. |
| Semimanufactures | 690 | 949 | West Germany 481; Belgium-Luxembourg 270. |

See footnotes at end of table.

## Table 3.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Magnesium including alloys: | | | |
| Scrap | 89 | 344 | West Germany 109. |
| Unwrought | 784 | 1,612 | U.S.S.R. 448; United States 412; Norway 354. |
| Semimanufactures | 41 | 93 | West Germany 51; United Kingdom 14. |
| Manganese: | | | |
| Ore and concentrate thousand tons | 1,123 | 1,432 | Gabon 645. |
| Oxide | 4,171 | 5,595 | Japan 2,942; West Germany 1,333; Belgium-Luxembourg 1,133. |
| Metal, all forms | 598 | 735 | United States 373; Japan 277. |
| Mercury, all forms 76-pound flasks | 7,455 | 11,458 | Italy 3,858; Spain 3,423; U.S.S.R. 1,653. |
| Molybdenum: | | | |
| Ore and concentrate | 5,331 | 7,544 | Canada 3,333; United States 2,166; Netherlands 1,020. |
| Oxide | r 64 | 153 | Netherlands 81; West Germany 72. |
| Metal, all forms | 156 | 182 | West Germany 61; Austria 44; United States 34. |
| Nickel: | | | |
| Matte | 18,905 | 15,481 | Mainly from New Caledonia. |
| Oxide and hydroxide | 103 | 538 | West Germany 242; Norway 164. |
| Metal including alloys: | | | |
| Scrap | 752 | 1,986 | Canada 827; Spain 325. |
| Unwrought | 14,181 | 10,499 | United Kingdom 3,026; Canada 2,551; U.S.S.R. 2,062. |
| Semimanufactures (including anodes) | r 3,883 | 4,959 | West Germany 2,369; United Kingdom 1,039; United States 871. |
| Platinum and platinum group: | | | |
| Ashes and sweepings kilograms | 1,153 | 1,619 | Netherlands 670; Brazil 261. |
| Metals troy ounces | 289,003 | 425,997 | U.S.S.R. 139,213; West Germany 80,312; United Kingdom 46,844. |
| Selenium | 95 | 83 | Japan 34; Sweden 20; United States 10. |
| Silver: | | | |
| Ashes and sweepings kilograms | 7,935 | 11,723 | Netherlands 4,574; Spain 3,340. |
| Metal, all forms thousand troy ounces | 34,490 | 48,737 | West Germany 18,985; United Kingdom 10,205. |
| Tantalum, all forms | 19 | 26 | United States 17; Belgium-Luxembourg 4; West Germany 2. |
| Thorium: | | | |
| Ore (Monazite) | 4,652 | 3,494 | Australia 2,567; Malaysia 740. |
| Metal value, thousands [2] | r (6) | (6) | NA. |
| Tin: | | | |
| Oxide long tons | 169 | 176 | Belgium-Luxembourg 88; West Germany 42; Italy 40. |
| Metal including alloys: | | | |
| Scrap do | 163 | 182 | Italy 107; Switzerland 66. |
| Ingots do | 11,337 | 12,047 | Malaysia 4,776; United Kingdom 2,523; People's Republic of China 1,642. |
| Semimanufactures do | 165 | 183 | West Germany 48; Belgium-Luxembourg 31; Netherlands 28. |
| Titanium: | | | |
| Ore | 139,703 | 10,166 | Mainly from Australia. |
| Oxide | 30,535 | 35,817 | West Germany 16,929; Belgium-Luxembourg 5,516. |
| Metal, all forms | 1,071 | 1,364 | United Kingdom 449; U.S.S.R. 435; West Germany 180. |
| Tungsten: | | | |
| Ore | 1,891 | 2,497 | People's Republic of China 591; Republic of Korea 574; Brazil 300. |
| Trioxide | 5 | 31 | All from West Germany. |
| Metal, all forms | 118 | 161 | West Germany 94. |
| Uranium: | | | |
| Ore | 1,540 | 2,538 | Niger 1,461; Gabon 1,077. |
| Metal including alloys kilograms | 330,201 | 1,214,155 | United States 508,359; Belgium-Luxembourg 419,382; Spain 218,582. |

See footnotes at end of table.

## Table 3.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Zinc: | | | |
| Ore and concentrate | 436,517 | 465,181 | Canada 145,092; Peru 124,829. |
| Oxide | 5,583 | 4,254 | Italy 1,061; West Germany 807; United Kingdom 634. |
| Metal including alloys: | | | |
| Scrap | 17,937 | 22,817 | Netherlands 8,510; Belgium-Luxembourg 8,183; West Germany 2,622. |
| Blue powder | 4,480 | 4,617 | Mainly from Belgium-Luxembourg. |
| Unwrought | 61,708 | 66,664 | Belgium-Luxembourg 29,824; West Germany 8,181; Netherlands 6,808. |
| Semimanufactures | 3,654 | 4,194 | West Germany 2,319. |
| Zirconium: | | | |
| Ore | 32,163 | 39,708 | Mainly from Australia. |
| Oxide | 400 | [7] 480 | United Kingdom 321; U.S.S.R. 60; United States 50. |
| Metal | 21 | 134 | United Kingdom 82. |
| Other: | | | |
| Ashes and concentrates | 15,655 | 5,767 | Guiana 3,759; Austria 799; Australia 571. |
| Ashes and residues containing nonferrous metals: | | | |
| Aluminum | 8,764 | 8,926 | West Germany 2,400; Italy 2,375; Netherlands 1,551. |
| Copper | 1,587 | 135 | Mainly from West Germany. |
| Lead | 1,362 | 1,093 | Switzerland 395. |
| Nickel | 95 | 75 | NA. |
| Zinc | 13,992 | 72,106 | Liberia 54,529; West Germany 9,336. |
| Other | 25,788 | 8,439 | West Germany 4,685; Canada 2,932. |
| Metal including alloys, all forms | 176 | 69 | Brazil 33; West Germany 9. |
| NONMETALS | | | |
| Abrasives: | | | |
| Emery, natural corundum, other | 57,044 | 38,895 | Mainly from Turkey. |
| Pumice | 11,350 | 7,198 | Italy 2,813. |
| Dust and powder of precious and semiprecious stones value, thousands [2] | r $5,341 | $8,081 | United States $2,990; Switzerland $1,718; United Kingdom $1,673. |
| Grinding and polishing wheels | 6,322 | 7,213 | Italy 1,732; West Germany 1,552; Belgium-Luxembourg 1,407. |
| Asbestos | 148,298 | 158,549 | Canada 80,482; U.S.S.R. 43,528; United States 19,097. |
| Barite and witherite | 64,423 | 54,430 | West Germany 33,810; People's Republic of China 14,169. |
| Boron materials: | | | |
| Crude natural borates | 105,743 | 127,815 | United States 68,797; Turkey 54,736. |
| Oxide and acid | 1,213 | 1,966 | Italy 1,124; United States 400; Turkey 384. |
| Bromine | 67 | 260 | Israel 210. |
| Cement | 37,172 | 183,082 | Belgium-Luxembourg 61,671; West Germany 55,834; Switzerland 32,688. |
| Chalk | 7,263 | 25,129 | Belgium-Luxembourg 12,169; West Germany 10,897. |
| Clays and clay products: | | | |
| Crude: | | | |
| Kaolin including calcined | 304,567 | 348,505 | United Kingdom 280,425. |
| Bentonite | 105,782 | 72,907 | Greece 24,445; Italy 19,492; West Germany 17,162. |
| Clay and refractory construction materials (bricks, etc.) | 733,563 | 855,573 | Italy 306,667; West Germany 304,241. |
| Cryolite and chiolite, natural | 1,334 | 867 | Mainly from Denmark. |
| Diamond: | | | |
| Industrial, except dust value, thousands [2] | r $5,518 | $5,526 | Belgium-Luxembourg $2,023; Ireland $5,545; United Kingdom $1,428. |
| Gem, unset ——— do | r $37,930 | $62,961 | Belgium-Luxembourg $20,043; Switzerland $15,979; Israel $10,070. |
| Diatomite | 5,760 | 7,376 | United States 2,120; West Germany 1,645; Denmark 817. |
| Feldspar | 31,757 | 7,374 | West Germany 4,933. |

See footnotes at end of table.

## Table 3.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous (natural sodium nitrate) | 23,397 | r 11,378 | Mainly from Chile. |
| Phosphate rock thousand tons | 4,158 | 4,919 | Morocco 1,708; Togo 1,170; United States 668. |
| Manufactured: | | | |
| Nitrogenous | 735,139 | 784,881 | Belgium-Luxembourg 251; Romania 109,836; Netherlands 95,209. |
| Potassic | 323,808 | 431,835 | Israel 144,084; Belgium-Luxembourg 89,583; Canada 74,677. |
| Phoshatic: | | | |
| Basic slag | 891,004 | 761,665 | Belgium-Luxembourg 669,954; West Germany 91,129. |
| Other | 407,684 | 453,932 | Netherlands 135,702; Belgium-Luxembourg 107,552; Tunisia 69,856. |
| Ammonia, anhydrous | 245,045 | 365,490 | Belgium-Luxembourg 157,233; United States 89,824; Netherlands 54,807. |
| Flint (pebbles) | 878,238 | 935,527 | United Kingdom 878,013. |
| Fluorspar | r 3,776 | 6,071 | West Germany 1,563; United States 1,465; Italy 1,045. |
| Graphite | 4,456 | 8,334 | Madagascar 3,085; Italy 1,384; West Germany 1,153. |
| Gypsum and plaster | 42,127 | 7,640 | West Germany 5,476. |
| Iodine, crude | 889 | 669 | Mainly from Japan. |
| Lime | 182,479 | 180,197 | Belgium-Luxembourg 118,054; West Germany 56,437. |
| Lithium and strontium minerals | 3,447 | 3,428 | Mozambique 1,089; United Kingdom 941; United States 844. |
| Magnesite, including calcined | 47,514 | 63,010 | Austria 19,642; Greece 9,127. |
| Mica | 5,731 | 5,120 | India 2,387; Norway 1,117. |
| Pigments: | | | |
| Earth pigments, including iron oxides | 2,334 | 1,386 | West Germany 260. |
| Earth, other (pozzolanic), santorin, etc | 597 | 1,995 | NA. |
| Precious and semiprecious stones [8] value, thousands [2] | r $22,114 | $34,610 | India $11,218; Switzerland $9,178. |
| Pyrite | 204,281 | 156,798 | Cyprus 115,709; U.S.S.R. 35,951. |
| Salt | 122,699 | 195,179 | Belgium-Luxembourg 77,780; Netherlands 45,865. |
| Sodium and potassium salts, n.e.s.: | | | |
| Caustic soda | 51,135 | 84,178 | Belgium-Luxembourg 50,823; Switzerland 9,805. |
| Caustic potash and peroxides of potassium and sodium | 403 | 997 | West Germany 308. |
| Stone, sand and gravel: [9] | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Slate | 2,055 | 4,493 | United Kingdom 2,647; U.S.S.R. 475. |
| Other | 216,591 | 308,619 | West Germany 95,680; Italy 78,424; United States 60,847. |
| Worked: | | | |
| Slate | 49,220 | 59,123 | Mainly from Spain. |
| Other | r 110,231 | 134,820 | Italy 98,383; West Germany 24,442. |
| Dolomite, chiefly refractory grade | 319,688 | 307,370 | Belgium-Luxembourg 229,720; West Germany 72,206. |
| Gravel and crushed stone thousand tons | 5,881 | 5,732 | Belgium-Luxembourg 4,435; United Kingdom 953. |
| Limestone | 213,718 | 260,820 | Mainly from Belgium-Luxembourg. |
| Quartz and quartzite | 21,902 | 26,655 | West Germany 11,595; Italy 9,799. |
| Sand excluding metal bearing thousand tons | 1,744 | 1,705 | Belgium-Luxembourg 801; United Kingdom 415; Netherlands 351. |
| Sulfur, elemental, all grades | 459,659 | 561,031 | Poland 188,093; United States 147,037; Canada 115,104. |
| Talc and steatite | r 7,608 | 7,080 | Italy 2,407; Belgium-Luxembourg 2,153; Norway 1,355. |
| Other nonmetals, n.e.s | r 831,218 | 995,006 | Switzerland 824,572. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 1,440 | 2,418 | United States 1,009; West Germany 811. |
| Carbon black | 66,024 | 66,306 | Netherlands 36,624; West Germany 11,425; United States 9,491. |

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Coal and briquets: | | | |
| Coal ---------- thousand tons -- | 11,884 | 12,499 | West Germany 5,938; United States 2,326; Poland 1,820. |
| Coal briquets ---------- do ---- | 122 | 109 | Netherlands 55; Belgium-Luxembourg 37; West Germany 13. |
| Lignite and lignite briquets ---------- do ---- | 233 | 244 | Mainly from West Germany. |
| Coke ---------- do ---- | 2,652 | 3,498 | West Germany 3,014. |
| Gas, natural ------ million cubic feet -- | r 248,794 | 334,525 | Netherlands 278,508; Algeria 56,000. |
| Hydrogen and rare gases ---------- | 12,359 | 17,785 | West Germany 10,835; Belgium-Luxembourg 5,555. |
| Peat including briquets thousand tons -- | r 62 | 74 | West Germany 42; Netherlands 17; U.S.S.R. 9. |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels -- | r 889,830 | 1,003,354 | Saudi Arabia 237,954; Iraq 140,668; Kuwait 118,767. |
| Refinery products: | | | |
| Gasoline ---------- do ---- | 17,382 | 15,309 | Italy 6,432; West Germany 5,143. |
| Kerosine thousand 42-gallon barrels -- | 563 | 602 | United Kingdom 190; Italy 119; Algeria 73. |
| Distillate fuel oil ------ do ---- | 32,990 | 21,030 | Italy 8,564; U.S.S.R. 6,105. |
| Residual fuel oil ------ do ---- | 11,969 | 11,168 | Italy 3,223; Netherlands 2,853; West Germany 1,939. |
| Lubricants ---------- do ---- | 501 | 587 | United Kingdom 160; West Germany 102; Netherlands 84. |
| Other: | | | |
| Liquefied petroleum gas do ---- | 9,795 | 2,911 | U.S.S.R. 1,107; Spain 384; Italy 290. |
| Vaseline, waxes, petroleum coke, bitumen, mixtures of bitumen, etc - do ---- | r 1,847 | 3,315 | United States 2,210; West Germany 418. |
| Mineral tar and crude chemicals derived from coal, petroleum, or gas -------- | 320,227 | 265,449 | United States 94,539; West Germany 52,518; Belgium-Luxembourg 50,302. |

r Revised. NA Not available.
1 Excludes artificial corundum.
2 Based on exchange rates of 5.0443 francs per U.S. dollar in 1972 and 4.4540 francs per U.S. dollar in 1973.
3 Includes vanadium.
4 Includes cast iron and sponge, powder, etc., of iron and steel.
5 Including wire rod.
6 Less than ½ unit.
7 Includes oxides of germanium.
8 Including synthetic and reconstituted stone, but not including diamond.
9 Excludes flint and industrial limestone.

## COMMODITY REVIEW

### METALS

**Bauxite.**—Production of bauxite decreased 11% and alumina increased slightly in 1974, compared with that of 1973. Combined primary and secondary aluminum production increased 7% in 1974 compared with that of 1973.

PUK, a leading aluminum producer in France, continued construction of a pilot plant at l'Estaque in the Rhône Delta, which was to cost about $8 million and was expected to be in full operation by 1976. The plant was to employ PUK's new $H^+$ process using sulfuric acid to break down the aluminum silicate found in most ordinary clays and shales. The impure aluminum sulfate produced will be converted to aluminum chloride by the addition of hydrochloric acid, and the final alumina product obtained by a recrystallization process. PUK officials counted on the process to free the aluminum industry from dependence on bauxite and perhaps to partially reorient alumina production toward utilization of shales and clays. PUK reported that, depending on the alumina content of clay, 60 to 100

tons of clay would be required to produce 20 tons of alumina.

**Gold.**—Gold production decreased 44% in 1974, compared with 1973 output. High gold prices prompted reexamination of a gold deposit near Limoges in central France. Also a consortium was formed by France's Société Minière et Métallurgique de Peñarroya S.A. and BRGM each with a 37.5% share, and Belgium's Compagnie Royale Asturienne des Mines S.A., with 25% share to examine and evaluate some of the promising French deposits. In 1974 the consortium evaluated the Bornieux area and reported 400,000 troy ounces of gold that can be extracted economically.

**Iron Ore.**—Iron ore production increased slightly in 1974 compared with the 1973 output. In the Lorraine Basin, which contributed 92% of the iron ore produced in the country, two ore types were identified, calcareous ore with 750 million tons of reserves and siliceous ore with 750 million tons. The West Basin and the Pyrénées Basin provided the remainder. The output of each basin from 1972 to 1974 in thousand tons follows:

| | Lorraine Basin | West Basin | Pyrénées Basin | Total |
|---|---|---|---|---|
| 1972 | 52,085 | 2,065 | 96 | 54,246 |
| 1973 | 51,958 | 2,178 | 92 | [1]54,228 |
| 1974 | 51,991 | 2,178 | 91 | 54,260 |

[1] Data do not agree with that shown on table 1 because of difference in source.

Source: Chambre Syndicale des Mines de Fer de France, Rapport d'Activité, 1974, p. 13.

**Iron and Steel.**—French crude steel production in 1974 increased 7% above that produced in 1973 to 27 million tons. This constituted 17.3% of the European Communities (EC) total production as compared with a 16.9% share of 1973. French iron and steel industry officials believed that a 929 million ton production could be reached by yearend in the absence of technical incidents, strikes, or an economic downturn.

Progress during the course of the year at Solmer's various installations resulted in a total output of 820,000 tons and began to alter the traditional regional distribution of French iron and steel production. Eastern France, whose share of production was declining, remained the chief producing region with 52.7% of domestic production. The north, in spite of the increased capacities at complexes in Dunkirk and Mardyck, was barely holding on to its own share of production with 33.4%. Other regions, particularly the south gained rapidly in the productive share, garnering 12.9% in 1974, an increase of 35.4% over the 1973 level. Steel production by the various processes in 1973 and 1974, showing the trend toward more oxygen process, was as follows in thousand tons:

| Process | 1973 | Percent | 1974 | Percent |
|---|---|---|---|---|
| Thomas | 6,158 | 24.4 | 5,188 | 19.2 |
| Pure oxygen | 13,143 | 52.0 | 15,793 | 58.5 |
| Martin | 3,273 | 13.0 | 2,927 | 10.8 |
| Electric | 2,685 | 10.6 | 3,110 | 11.5 |
| Other | 5 | -- | 5 | -- |
| Total | 25,264 | 100.0 | 27,023 | 100.0 |

Specialty steel production increased 6.6%, from 2.89 million tons in 1973 to 3.08 million tons in 1974. This category of steel continued to represent 11.4% of total French steel production. Total rolled steel production amounted to 20.9 million tons in 1974 compared with 19.5 million tons in 1973. Due to the opening of new installations in Mardyck, Seremange, and Basse-Indre, production of tinplate, black iron, and tinned sheet increased 16.5% in 1974. Production of galvanized sheet held steady at 813,000 tons but production of other coated sheets decreased 17.5% to 137,000 tons in 1974 compared with 1973 production.

The number of people employed by firms in the French iron and steel industry increased by 4%, from 151,514 to 157,629. Geographically those employed in the north of France increased 4.2% in 1974 compared with the 1973 level. Following the completion of the Solmer and Ugine Aciéries plants in Fos-sur-Mer, employment in south-central France increased 17.3%. In the east, there was some reduction in employment. Expressed in terms of man-hours per ton of raw steel produced, productivity increased from 11.08 in 1973 to 10.82 in 1974. The improvement would have been greater had it not been for the fact that more workers were employed at Solmer during the plant startup period than were necessary for production. This plant aside, French productivity increased 3% in 1974.

In 1974 total investment in the steel industry declined 24.3% compared with the 1973 investment level. Of the investment which did take place, nearly 60% was in Solmer and Union Sidérurgique du Nord de la France (USINOR). The investment downturn was partially due to a malaise in general activity during the last half of 1974. Also, the year marked the completion of the USINOR plant extension in Dunkirk and the completion of the first phase of Solmer's complex in Fos-sur-Mer. Other investments made in 1974 involved converting to more efficient steelmaking methods, particularly conversion to the pure oxygen processes. Modernization was to continue in 1975 with the installation of an Linz-Donawitz (LD) converter at Mondeville to replace the old Thomas and Martin steelworks. Ministeelworks, employing electric processes, were constructed in Porcheville and Toulon, and an electric furnace was modernized by the Société des Hauts Fourneaux de la Chiers. Four other electric ministeelworks were scheduled to go into operation in 1975.

French steel exports made a strong showing in 1974, registering a solid 18.3% increase compared with the 1973 level. A number of factors contributed to French export strength in 1974: New units went into production; domestic demand did not increase from that of 1973; world prices were higher than those in the EC; and several French steel firms made considerable investments in marketing operations abroad and thus were in a position to maximize sales in the newly enlarged EC and in countries where free exchange agreements were reached.

French sales to countries outside EC increased by nearly a million tons. In the case of sales to the United States, exports increased from 987,000 tons in 1973 to 1.26 million in 1974, an increase of 27%.

Overall French imports of steel declined only 1.4% in 1974, from 7.8 to 7.7 million tons. Of interest was the much sharper decline in imports from outside of the European Iron and Steel Community. Such imports decreased 16.3%, dropping to 548,000 tons in 1974 from 655,000 tons in 1973. Steel imports from the United States decreased from 30,200 tons in 1973 to 8,800 tons in 1974. The most notable slump was in regular steel ingot.

Not included in overall French steel import-export figures were those for ferrous scrap. French imports from the United States dropped from 27,800 tons to 11,800 in 1974. Overall French imports declined as scrap needs were increasingly met from domestic sources.

**Lead-Zinc.**—Construction of the electrolytic zinc plant at Auby in the northern part of France continued in 1974. The Auby zinc plant, with an 80,000-ton capacity, was to replace the conventional zinc plant of the Compagnie Royale Asturienne des Mines in the early part of 1975 and was to cost about $40 million. Feed for the plant was to come primarily from Canada and Sweden in the form of lead-zinc concentrates.

Production of primary and secondary refined lead decreased 16% in 1974 compared with that of 1973. An increase of 7% was reported in zinc slab production in 1974 over that of 1973.

The prospecting work of Royale Asturienne des Mines continued in the Chenelette permit and Cenadere permit of the Upper Pyrénées. However, no results were available by the end of 1974.

**Titanium.**—Information on titanium activities in France is somewhat limited. However, Thann et Mulhouse was building more capacity at its sulfate-process pigment plant at Le Havre in 1974. Additions of 22,000 tons per year in 1975 and 13,000 in 1977 were to bring total plant capacity to 100,000 tons per year.

## NONMETALS

**Barite.**—The combined exploration efforts of Société des Mines de Garrot Chaillac (SMGC) and BRGM resulted in evaluation of an important barite deposit in 1974. The deposit known as Rossignol situated about 50 kilometers south-southwest of Chateauroux, in Indre Département, overlaid gneissic rock of the Massif Central with an average barite thickness of 12 meters. The barite-bearing horizon spread over 190,000 square meters and was estimated to contain about 8 million tons of crude barite ore, with 4 million tons of recoverable ore. The deposit would be amenable to open pit mining.

Production was scheduled to start in mid-1975, at a rate of 100,000 tons of concentrate per year. Part of the recovery was to be by gravity methods, (about 20,000 tons), while the remaining was slated for flotation techniques. All of the

production management was to be by SMGC according to the agreement.

Barite production decreased 5% in 1974 compared with the 1973 output. Part of the new production from Rossignol was to be for export to EC markets.

**Borax.**—Borax Français, a wholly-owned subsidiary of Rio Tinto Zinc Borax increased the capacity of its boric acid plant at Conde-Kerque by 25,000 tons per year in 1974. More expansion was underway for 1975 and when completed in 1976 the boric acid plant was to produce 50,000 tons per year.

**Fluorspar.**—PUK and Société Denain-Anzen Minéraux (DAM) remained the most important producers and consumers of fluorspar during 1974. Total production of fluorspar from both companies and 10 smaller companies amounted to 610,000 tons, an 7% increase compared with 1973 production.

Construction of a high-purity hydrofluoric acid plant by Rhône-Poulenc S.A. continued at Salindres. Production at the Salindres plant, with 1,000 tons annual capacity was slated to begin in mid-1976. Dong Trieu Société Française Immobiliére et Miniére S.A. obtained an exploration permit for a 20-square-kilometer area in central France to search for fluorspar and related mineral during 1974.

**Potash.**—Pollution of the Rhine River remained a serious problem for local communities bordering the river and the countries through which it flows. In 1974 a ministerial conference was held, following earlier meetings in La Havre and Bonn to seek solutions. Switzerland was the first to construct four waste-treatment plants and to make plans for others in an attempt to drastically cut water pollution in the Rhine by 1982. Although these measures rendered the Rhine cleaner at its upper reaches, Dutch communities, which relied on the Rhine River for their drinking water, had little relief, since, as soon as the river left Switzerland, it entered the heavily polluting area of France—the Alsace region. One company alone, Mines Dominales de Potasse d'Alsace (MDPA), discharged 18,000 tons per day of potash effluent into the river. By the time the Rhine reached the sea it contained 85 tons of mercury, 1,000 tons of arsenic, 200 tons of cadmium, 1,500 tons of lead, and 30,000 tons of hydrochloric acid per year.

Various solutions were being considered; transfer of the salt by pipe for discharge into the North Sea, or sale of salt for snow cleaning and stockpiling. However, by yearend no clear decision was made.

**Pyrite**— Exploration efforts of the Société des Mines et des Produits Chimiques de Salsique (SMPCS) continued during the year in the Saint-Bel area. The company's production of pyrite was halted in 1973 because of ore depletion and high costs of processing the lower grade deposits.

**Sulfur.**—Société Nationale des Pétroles d'Aquitaine (SNPA) remained the main sulfur producer in France in 1974. With production from its natural gas deposits at Laçq, in the southwest of France, output was 1.84 million tons, slightly below the previous year; however, production of about 70,000 tons from other sources was sufficient to meet domestic demand as well as to supply the export market.

## MINERAL FUELS

The French Government set up a special committee to determine whether the 1928 law giving the provinces power to regulate the French oil market should be revised. The Finance Ministry was also examining whether any changes should be made in the tax treatment of oil companies and the special tax levy introduced in 1973. Parliament was expected to assume a stronger hand in operations of the French oil industry in the future.

Annual reports released by French oil companies in 1974 indicated that the industry invested $2.7 billion in 1974 compared to the $1.8 billion in 1973. Spending in the refinery sector rose from $30 million in 1973 to $34 million in 1974, in storage and distribution, spending rose from $30 million to $39 million, and foreign investment jumped from $73 million to $1.5 billion. Commenting on the Government's objective of reducing French oil consumption to 96 million tons in 1985 or 40% of total energy consumption compared with 65% in 1974, the oil industry expressed doubts as to whether these goals could be met if economic growth was kept at the planned annual rate of 5%. They felt, that even with achievement of the maximum objectives of the Government, oil and gas would still account for 55% of French energy consumption by 1985, excluding the needs of the chemical industry.

The Government, in order to reduce energy consumption in 1974, cut use in public departments by 20%, and raised the prices of oil products, gas, and electricity by an average of 5%. In order to help the petrochemical manufacturers, the French Government kept costs as low as possible, by waiving all internal taxation on feedstock, including all petroleum and natural gas products.

**Coal.**—The French Government worked out a wide-ranging plan designed to reduce the country's dependence on foreign sources of energy. The plan called for an additional 46 million to 50 million tons of domestic coal production between 1975 and 1985. The goal was set at 21 million additional tons instead of the 14 million ton target set previously. Central to the plan were the Lorraine coalfields where the output of 9.5 million tons of 1974 was to be increased to 10 million per year until 1985. Production in the Nord/Pas-de-Calais Basin was to be increased to 5 million tons in 1985. Although the new plan was approved, the miners' trade unions called for revised production figures. The union labeled the plan inadequate, not in keeping with EC energy policy, and irresponsible in view of France's energy situation in general.

In addition to France's well-known coalfields of Nord/Pas-de-Calais, Lorraine, and Centre-Midi, other deposits existed in France, which were not deemed profitable prior to the 1973 general change in market conditions. Foremost of the untapped reserves was in the Jurassic formation at Lons-Saulnier where 200 million tons of coking coal was measured. Other important deposits were at Decize with about a 45-million-ton reserve, and at Bas-Dauphine and Bert-Montcourbroux with total reserves of 40 million tons.

The state-owned Charbonnages de France (CDF) joined a number of French steel companies in announcing plans to spend $40 million for the purchase of majority holdings in an unidentified West Virginia coal mine in the United States. About $20 million of the investment was to be used in renovating the mine. It was understood that, if the plan becomes a reality, France would import about 2 million tons per year from this mine.

Compared with 1973, coal production declined 2.8 million tons or 9.7% in 1974 while coke production increased 3.4%. Stocks of coal were unchanged, whereas stocks of lignite were reduced by 100,000 tons at yearend 1974. Production data on the major producing area are shown in table 4.

**Table 4.—France: Salient statistics of the coal and lignite industry**
(Thousand metric tons unless otherwise specified)

| | 1973 | 1974 |
|---|---|---|
| **COAL (ANTHRACITE AND BITUMINOUS)** | | |
| Production: | | |
| Nord/Pas-de-Calais | 10,404 | 9,011 |
| Lorraine | 10,111 | 9,066 |
| Aquitaine | r 1,187 | 1,184 |
| Auvergne | 469 | 424 |
| Blansy | 1,400 | 1,446 |
| Cevénnes | 985 | 836 |
| Dauphiné | 430 | 375 |
| Loire | 696 | 554 |
| Others | -- | -- |
| Total | [1]25,682 | 22,896 |
| Average number of days worked | 237.2 | 229 |
| Average daily output (tons) | 108.3 | 100 |
| Number of workers: | | |
| Underground | 44,883 | 42,106 |
| Overall | 75,773 | 67,432 |
| Production per man-shift (tons): | | |
| Underground | 2.413 | 2.371 |
| Overall | 1.381 | 1.480 |
| Stocks at yearend: | | |
| Shipping ore | 422 | 552 |
| Low-grade | 1,919 | 1,554 |
| **LIGNITE** | | |
| Production: | | |
| Province | 1,454 | [1]1,604 |
| Region Landaise | 1,310 | -- |
| Number of days worked | 240.5 | 240.0 |
| Average daily output (tons) | 11.5 | 6.68 |
| Number of workers | 1,955 | 1,200 |
| Output per man-shift (tons) | 5.872 | 5.567 |

[1] Data do not agree with that shown on table 1 because of difference in source.

Source: Charbonnages de France. Statistique Annuelle (Paris), 1974, pp. 8–9.

**Coke.**—Total coke production increased 3.4% between 1973 and 1974. However output by collieries only decreased about 14% in 1974 compared with 1973 production. Among the producing coal basins, only Aquitaine of Centre-Midi showed a slight production increase. Colliery production of coke and semicoke in the four basins, in thousand tons, for the years 1972–74 follow:

| | 1972 | 1973 | 1974 |
|---|---|---|---|
| Nord/Pas-de-Calais | 3,823 | 4,245 | 3,632 |
| Lorraine | 2,356 | 2,515 | 2,159 |
| Aquitaine | 376 | 353 | 358 |
| Loire | 252 | 224 | 132 |
| Total | 6,807 | 7,337 | 6,281 |

Source: Charbonnages de France. Rapport de Gestion (Paris), 1974, p. 78.

The shipment of coke and semicoke from collieries to various industries in France, in thousand tons, during 1972–74 follow:

| | 1972 | 1973 | 1974 |
|---|---|---|---|
| Steel industry | 4,201 | 4,627 | 3,629 |
| Other industries | 1,162 | 1,231 | 1,290 |
| Small industries | 320 | 298 | 232 |
| Exports | 515 | 861 | 964 |
| Domestic consumption | 480 | 498 | 451 |
| Total | 6,678 | 7,515 | 6,566 |

Source: Charbonnages de France, Rapport de Gestion (Paris). 1974, p. 78.

Exports and imports of solid fuels, in thousand tons, in 1973–74 follow:

| | Exports | | Imports | |
|---|---|---|---|---|
| | 1973 | 1974 | 1973 | 1974 |
| Coal (anthracite and bituminous) | [1]981 | 907 | 12,499 | 12,505 |
| Coke | 917 | 989 | 3,498 | 3,624 |
| Patent fuel | 80 | 234 | 109 | 213 |
| Lignite briquets | -- | 62 | 244 | 338 |
| Total[2] | 1,978 | 2,192 | 16,350 | 16,680 |

[1] Includes a small amount of lignite.
[2] Data do not agree with that shown on tables 2 and 3 because of difference in source.

Source: Statistique Annuelle (Paris). Monthly issues 1974.

Imports of coal, coke and agglomerates, in thousand tons by country of origin, for 1973 and 1974 follow:

| Origin | 1973 r | | | 1974 | | |
|---|---|---|---|---|---|---|
| | Coal | Coke | Agglomerates | Coal | Coke | Agglomerates |
| Australia | 99 | -- | -- | 699 | -- | -- |
| Belgium | 200 | 110 | 37 | 148 | 150 | 24 |
| Germany, West | 4,467 | 2,684 | 248 | 5,250 | 3,462 | 284 |
| Morocco | 2 | -- | -- | 89 | 27 | -- |
| Netherlands | 367 | 305 | 53 | 175 | 384 | -- |
| Poland | 1,968 | -- | -- | 3,308 | -- | -- |
| South Africa, Republic of | 501 | -- | -- | 426 | -- | -- |
| U.S.S.R | 1,079 | -- | -- | 1,530 | -- | -- |
| United Kingdom | 507 | -- | -- | 576 | 88 | -- |
| United States | 1,792 | -- | -- | 2,758 | -- | -- |
| Others | 1,524 | 475 | -- | 1,390 | 461 | -- |
| Total[1] | 12,506 | 3,624 | 338 | 16,415 | 4,602 | 308 |

r Revised.
[1] Data do not agree with that shown on table 3 because of difference in source.

Source: Charbonnages de France, Rapport de Gestion (Paris) 1974, p. 63.

**Natural Gas.**—The natural gas industry continued to expand its share of the energy market during 1974, although at a somewhat reduced rate. During the year natural gas accounted for 9.2% of total French energy consumption, an increase of 8.8% over the 1973 level. French energy planners were confident that natural gas can continue to expand its share of the market and were looking toward its supplying approximately 13% of total French energy consumption in 1985. This expansion required increasing quantities of imports as domestic production had already leveled off at about 7.5 billion cubic meters.

Imports of natural gas from the Netherlands and Algeria increased in 1974, to 9.9 billion cubic meters, compared with 8.3

billion cubic meters in 1973. French companies continued negotiations for future gas supplies from the Soviet Union, Algeria, Norway, and from Iran where the French discovered large reserves.

**Petroleum.**—At yearend 1974, oil had retreated to its 1972 position in French energy consumption, accounting for 64% of total consumption as opposed to almost 67% in 1973. During the year, the French Government worked to establish a comprehensive energy policy designed to maintain the ground thus won and limit the future growth of oil consumption. Also, the Government was banking on an ambitious nuclear development program to bring French oil consumption down to approximately 40% of total energy consumption by the mid-1980's. In these circumstances, the country's refining and sales network entered into a period of relative stability or even stagnation.

French domestic oil production continued its fall, dropping 13% to only 1.08 million tons, or less than 1% of the national consumption. Crude oil imports totaled 129.8 million tons, or a drop of 3.3% below 1973, in reaction to higher prices, consumption reduction measures, and two successive mild winters. Middle Eastern and North African exporters supplied 87% of the country's requirements, with Saudi Arabia alone accounting for 32%. The full breakdown of crude imports by source in million tons follow:

| | 1973 | 1974 |
|---|---|---|
| Saudi Arabia | 20.17 | 41.4 |
| Iraq | 18.68 | 16.8 |
| Abu Dhabi and Oman | 15.87 | 14.9 |
| Kuwait | 15.48 | 12.4 |
| Nigeria | 12.59 | 10.5 |
| Algeria | 11.10 | 8.9 |
| Iran | 10.82 | 8.8 |
| Libya | 6.49 | 8.7 |
| U.S.S.R | 8.36 | .2 |
| Qatar | 3.41 | 3.5 |
| Venezuela | 1.80 | 1.5 |
| Gabon | 1.41 | 2.1 |
| Zaire | .95 | 1.5 |
| Others | 12.00 | 8.6 |
| Total | 134.13 | 129.8 |

Source: Comité Professionnel du Pétrole (Paris), 1974, p. 58.

Petroleum product imports dropped 6% during 1974, to 6.9 million tons, compared with 1973 imports. Import licenses for petroleum products, which were due to expire at the end of 1974, were extended with only minor modification by 1 year in view of the uncertain market situation.

Consumption of major oil products and natural gas in thousand tons in 1973–74 follow:

| Product | 1973 | 1974 |
|---|---|---|
| Regular gasoline | 3,532 | NA |
| Premium gasoline | 15,772 | 15,182 |
| Aviation gasoline | 48 | 38 |
| Jet fuel | 1,812 | 1,829 |
| Special gasoline | 78 | 71 |
| White spirit | 155 | 141 |
| Kerosine | 44 | 36 |
| Gas oil | 6,533 | 6,771 |
| Fuel oil, domestic | 37,217 | 31,541 |
| Light fuel oil | 2,023 | 1,602 |
| Heavy fuel oil | 34,134 | 34,528 |
| Lubricants | 1,051 | 1,009 |
| Liquefied petroleum gas | 2,696 | 2,666 |
| Bitumen | 3,395 | 3,154 |
| Paraffin wax | 66 | 68 |
| Petroleum coke | 395 | 431 |
| Incandescible gas | 215 | 174 |
| Petroleum fuel stocks | 3,831 | NA |
| Natural gas (billion cubic meters) | 15.4 | 17.4 |

NA Not available.

Source: Comité Professionnel du Pétrole (Paris), 1974, p. 174.

Total refinery production in 1974 decreased to 120.1 million tons compared with the 1973 level a drop of 4.6%. There were 128.1 million tons of crude treated, and in the process 8 million tons of crude were lost. Refinery capacity increased by 10% during the year, due to the completion of the new refinery of Compagnie Française des Pétroles (CFP) at Dunkirk capacity 6 million tons per year and the doubling of capacity at Shell's Petite-Couronne refinery to 18.8 million tons per year. Total refinery capacity of 169 million tons per year was expected to remain generally stable over the coming years as changed consumption patterns caused the shelving of all new refinery expansion projects. Thus, emphasis was switched from increased production capacity to increased efficiency yields at existing refineries and to the renewal of cracking units.

Details on production, trade, and consumption of major products, in thousand tons were as follow:

| Product | Refinery production | Domestic consumption | Exports | Imports |
|---|---|---|---|---|
| Gasoline | 16,791 | 15,182 | 1,807 | 276 |
| Aviation gas | 45 | 38 | -- | 25 |
| Jet fuel | 3,241 | 1,829 | 612 | 16 |
| Liquefied petroleum gas | 2,959 | 2,666 | 662 | 221 |
| Diesel oil | 13,666 | 6,771 | 3,812 | 1,842 |
| Heating oil | 29,956 | 31,541 | 14 | 103 |
| Light fraction and chemical feedstock | 6,305 | 5,447 | 646 | 883 |
| Lube oil | 1,302 | 1,009 | 457 | 102 |
| Asphalt | 3,715 | 3,154 | 486 | 4 |

French refinery capacity in million tons for the years 1965, 1973, and 1974, as well as location and ownership, follow:

| Location and refinery | 1965 | 1973 | 1974 |
|---|---|---|---|
| North: | | | |
| Dunkerque (BP) | 5.5 | 5.5 | 5.5 |
| Valenciennes (Antar) | -- | 3.5 | 3.5 |
| Le Havre/Basse-Seine: | | | |
| Gonfreville (CRF)[1] | 10.6 | 23.3 | 23.3 |
| Port-Jerome (Esso) | 4.0 | 7.2 | 7.2 |
| Petite-Couronne (Shell) | 5.5 | 9.2 | 18.8 |
| Gravenchon (Mobil) | 3.6 | 3.6 | 3.6 |
| Vernon (BP) | -- | 3.0 | 3.0 |
| Ile de France (Paris): | | | |
| Grandpuits (ELF) | -- | 3.6 | 3.6 |
| Gargenville (ELF) | -- | 6.0 | 6.0 |
| Atlantic: | | | |
| Donges (Antar) | 4.1 | 8.3 | 8.3 |
| Vern-sur-Seine (Antar) | 1.2 | 1.5 | 1.5 |
| Pauillac (Shell) | .5 | 4.0 | 4.0 |
| Ambès (ELF) | 1.8 | 2.1 | 2.1 |
| Bordeaux (Esso) | 2.4 | 2.9 | 2.9 |
| Mediterranean: | | | |
| Frontignan (Mobil) | 1.7 | 6.0 | 6.0 |
| La Mède (CFR) | 6.4 | 10.2 | 10.2 |
| Berre (Shell) | 6.0 | 13.5 | 13.5 |
| Lavéra (BP) | 4.4 | 11.0 | 11.0 |
| Fos-sur-Mer (Esso) | 3.0 | 8.0 | 8.0 |
| Alsace/Lorraine: | | | |
| Reichstett (CRR)[2] | 3.7 | 3.7 | 3.7 |
| Herrlisheim (SRS)[3] | 3.9 | 4.5 | 4.5 |
| Houconcourt (SRL)[4] | -- | 4.4 | 4.5 |
| Lyonnais: | | | |
| Feyzin (ELF) | 2.0 | 8.8 | 8.8 |
| Total | 70.3 | 153.8 | 163.5 |

[1] Compagnie Française de Raffinage (CRF).
[2] Compagnie Rhénane de Raffinage—Shell/Mobil/ELF.
[3] Société de la Raffinerie de Strasbourg—Antar/BP/CFR.
[4] Société de la Raffinerie de Lorraine—CFR/Esso/ELF.

Stocks increased markedly in 1974. Storage capacity increased by 3.2 million cubic meters to 65.4 million. Over 1 million cubic meters of the new capacity was attributed to the completion of the new Dunkirk refinery. In addition, storage capacity was increased by the creation of a new tank farm at Graveline of 540,000 cubic meters, and the addition of 900,000 cubic meters of capacity to the underground storage area of Manosque. Work also coninued on an underground heated storage depot of 3-million-cubic-meter capacity which was being built at Georgenville for industrial fuel oil. At the end of 1974, actual stocks on hand totaled 11 million tons of crude and 19.1 million tons of refinery products.

France's 1974 petroleum product imports of 6.9 million tons were predominantly from Italy, 1.4 million tons; West Germany, 1.2 million; the Soviet Union, 0.9 million; and the Netherlands, 0.7 million. The major markets for French petroleum product exports continued to be Switzerland and West Germany, which took 3 million tons each. Other significant export markets were the United States, 1 million tons; the Netherlands, 0.84 million; Belgium and Luxembourg, 0.8 million; and Spain 0.4 million.

*Consumption.*—Civilian crude oil consumption decreased 6% in 1974, to 105 million tons, compared with 1973 consumption. The major savings were undoubtedly due to the mild winter weather plus the short term consumption-depressing effect of higher prices. Although French Government policy encouraged economy in energy use during the year, the only significant and authoritative measure to that end, a domestic fuel rationing program, was not instituted until autumn of 1974. The Government was to develop a more comprehensive petroleum savings program for 1975 and perhaps for the next decade. Accordingly, a goal was to be set up for petroleum consumption in 1985, of 100 million tons per year, as opposed to 110 million tons in 1973.

*Exploration.*—Exploration continued at a low rate. Only nine exploratory and three development wells were drilled in 1974. New offshore exploration, particularly in the approaches to the English Channel, was held up during the year largely because of a demarcation dispute with the United Kingdom.

Departments of Finistère, Morbihan, Loire Atlantique, Vendée, Charente-Maritime, and Gironde were to offer permits for offshore oil and gas searches on France's Atlantic coast in 1975. Exclusive search permits were sought by CPF, British Petroleum, and Esso representatives. However, by the end of 1974 no conclusive contracts were reported.

A demarcation of the Franco-Spanish offshore boundaries in the Bay of Biscay area was agreed on in the early part of 1974 and was sent to both countries for ratification. According to this agreement proceeds and development costs of any mineral discoveries in the agreed area were to be shared jointly. At yearend 1974 discussion on the establishment of a median line along the Mediterranean coast of both countries continued.

*Transportation.*—There were no significant changes in inland transport facilities in France during the year. Construction of a port for supertankers continued at Cap Antifer near Le Havre and was scheduled for completion in 1978. Pipeline and other transport volumes were down, comensurate with the dropoff in refining and consumption. Nine major oil tankers were added to the French-flag fleet in 1974, for a total of 89 ships at the end of the year.

# The Mineral Industry of Gabon

By Janice L. W. Jolly [1]

The mineral industry of Gabon continued to show substantial improvement as crude petroleum (up 33.6%), uranium (up 15.6%), and manganese (up 9.7%) all showed production increases for 1974. Gabon was the fourth largest oil producer in Africa, following Nigeria, Libya, and Algeria.[2] After surpassing the 10-million-ton production level, Gabon became eligible for full membership in the Organization of Petroleum Exporting Countries (OPEC), in which it has held associate membership since November 1973. Gabon's earnings from the petroleum industry was estimated at $880 million [3] in 1974, compared with around $83 million in 1973. The rise in oil revenues brought Gabon's 1974 gross domestic product (GDP) to an unprecedented level of an estimated $1.3 billion for a country of 950,000 inhabitants. The growth in oil revenues was the result not only of increased production and higher oil prices, but also of increased oil royalties, corporate tax rates, and increased state acquisition of shares in oil companies. Because of the increase in oil revenues, the national budget for 1974, (originally set at $200 million), was increased to about $375 million, equally divided between development and administrative expenses. The new budget adopted for 1975 was balanced at $620 million; over 70% of it was earmarked for development projects. Adopted September 18, 1974, the budget included $9.6 million for the Trans-Gabon Railroad, which remained the Nation's foremost development project. Completion was scheduled for 1981.

The first section of the Trans-Gabon Railroad, costing more than $200 million, will link Owendo with Booué, a distance of about 206 miles. The second section will extend 233 miles from Booué to Franceville. On December 18, 1974, the French aid for both sections was raised to more than $46.7 million.[4] Others providing loans and credits for the building of the railroad were the following: Fonds Européen de Développement (FED), $8.6 million; African Development Bank (ADB), $6.2 million; French Aid Organization (FAO), $14.6 million; Italy, $11.2 million; Canada, $14.2 million; Federal Republic of Germany, $8.3 million; Japan, $10 million; Zaire $6.7 million; Algeria, about $1 million; Agency for International Development (AID), $5 million; Export-Import Bank (EXIM), $20 million; and Republic of South Africa, $17 million. The second section was expected to cost about $209 million, most of which was expected to be paid by the Gabon Government.[5]

The Government budgeted $2.2 million for a study of the mineral port at Santa Clara. Work on the port was planned to proceed in time for completion along with the Booué-Franceville leg of the Trans-Gabon Railroad so that it could be used to transport manganese. An asphalt plant was under construction in Port Gentil at a cost of $2.9 million. It was expected to begin production in February 1975 at the rate of 10,000 tons per year. A second refinery was started at Port Gentil in December 1973, costing around $26.7 mil-

[1] Physical scientist, Division of Ferrous Metals.
[2] Oil and Gas Journal. Worldwide Oil Production, Gabon. V. 72, No. 52, Dec. 30, 1974, p. 135.
[3] Where necessary, values have been converted from African Financial Community Francs (CFAF) to U.S. dollars at the rate of CFAF240 = US$1.00.
[4] Industries et Travaux D'Outre Mer (Paris). (Gabon.) V. 23, No. 254, January 1975, p. 74.
[5] Marches Tropicaux et Méditerranéens (Paris). Fed Financing for Trans-Gabon. June 7, 1974, p. 1605.

lion. The extension of the Port Gentil oil refinery, when completed, will increase refinery capacity from 1.2 million to 2.5 million tons.

Petroleum companies operating in Gabon agreed to reinvest 5% of their profits in Gabon in diversified projects chosen jointly by the Government and the petroleum companies. This 5% represented about $44 million in 1974, and was expected to rise to $60 million by 1975.[6] Eight important industrial projects were to be financed mostly through the investment funds of the petroleum companies and were to be managed by the new Ministry of Industrial Participation. These included an ammonia plant, representing a $26 million investment, to be completed in Port Gentil by Essence et Lubrificiant de France of Gabon (Elf-Gabon), and a U.S. firm, and a methanol plant, also a $25 million investment to be set up at Port Gentil by the Pierrefitte-Auby firm.

A ferromanganese plant near Franceville, under study by the Japanese firm Okura Trading Co., was in advanced stages. Société Gabonaise des Ferroalliages (SOGAFERRO) was to be formed with a capital of $4.2 million. Three participants were to be Gabon Government (10%), Compagnie Minières de l'Ogooué, S.A. (COMILOG) (15%), and Okura Trading Co. (25%), and the remaining 50% was to be distributed among Union Carbide Corp. (U.S.), Elkem–Spigerverket (Norway), Sadacem, Applications de la Chimie de l'Electricité et des Metaux S.A. (Belgium), and Tassara (Italy). The project would be operational in 1979 with plans to produce 135,000 tons per year of ferromanganese and silicomanganese alloys.[7]

Following the policy of joint participation when a new company is established the Gabonese receive 10% of the stock free with the option of increasing their participation up to 60% by purchasing additional stock at a price agreed upon. The company headquarters must be located in Gabon, and a Gabonese must be its director.[8] During 1974, the Government purchased or announced the following participation: Shell Oil Co. of Gabon (Shell-Gabon) (10%), Elf-Gabon (12%), Société des Mines de Fer de Mékambo (SOMIFER) (56%), Compagnie des Mines d' Uranium de Franceville (COMUF) (25%), Société Gabonaise de Raffinage (SOGARA) (30%), COMILOG (10%), National Petroleum Products Distribution Corp., (PIZO) (51%), Société des Ciments d'Owendo (51%), Société Gabonaise d'Entreposage de Produits Petroliers (25%), and the Société Gabonaise de Marbrerie et Matériaux (SOGAMAR) (54.4%).

The Bank of Gabon and Luxembourg, with headquarters in Libreville, was inaugurated in August 1974. The bank is 30% subscribed by Gabonese nationals, and 70% by a group associated with the International Company of Banks of Luxembourg. On November 19, 1974, the 10th year for the Customs and Economic Union of Central Africa (UDEAC) was celebrated at a meeting in Yaounde, Cameroon. Cameroon, Gabon, the Central African Republic, Congo, and Equatorial Guinea are members. Five projects were approved including the creation of a regional development bank with head offices in Brazzaville, Congo. The regional bank is planned as a community organization for the financing of economic and social development.[9]

The Petit Poubara hydroelectric dam was under construction by a French group, and another dam at Grand Poubara was being planned. The French Electric Co. was designing the plant for Grand Poubara dam, and plans were to be submitted to the Government at yearend 1976.[10]

The French Bureau de Recherches Géologique et Minières (BRGM) increased activities in Gabon on the following projects: (1) With COMILOG and Elf-Gabon, the continued study of copper, zinc, and gold samples in the Ndjolé region; (2) with COMILOG, gold prospecting in the Etéké region where a Gabonese state company was already working a deposit of placer gold; (3) with COMILOG, continuation of copper and nickel prospecting in the Franceville region, so far not encouraging; and (4) with COMILOG, Elf-Gabon, and the Aquitaine Oil Co. of Canada Ltd., a research program on mineral deposits at

[6] U.S. Embassy, Libreville, Gabon. State Department Airgram A-6, Jan. 21, 1975, 3 pp.
[7] Industries et Travaux D'Outre-Mer (Paris). (Gabon) V. 23, No. 258, May 1975, p. 446.
[8] U.S. Embassy, Libreville, Gabon. State Department Airgram A-069, Oct. 15, 1974, 11 pp.
[9] Jeune Afrique (Paris). A Second Decade for Another Type of Cooperation. Dec. 21, 1974, p. 30.
[10] Informations D'Outre-Mer (Paris). French Cooperation Aids Poubara Power Projects. April 30, 1975, p. 9.

Kroussou in Central Gabon. Other recent exploration included exploration for diamond at Mamfe, quartz crystals in the Batoure and Betare-Oya regions, and copper indications at Poli, Marova and Bibemi. Geological prospecting continued in cooperation with the United Nations Development Program (UNDP) in the Koula-moutou-Franceville region of southeastern Gabon and in the Woleu-Ntem region of northern Gabon. Results of this survey were soon to be available. The Gabon Government, in association with the United Nations, was also carrying on its own exploration to the west of Mouila in southwest Gabon. The State reportedly has invested $312,500, and the UNDP has put $437,500 into this effort.[11] Airborne geophysical prospecting was also being carried out with the assistance of the Canadian Government together with detailed mapping over an area covering 105,750 square miles.

## PRODUCTION AND TRADE

Crude petroleum production was 73,548,000 barrels (approximately 10.2 million tons) in 1974, representing an increase of 33.6% over 1973, and was expected to continue to rise. Oil prices doubled in late October 1973, and again in January 1974, reaching $13.03 per barrel for Mandji quality and $13.80 for Gamba quality. Gross gas production was estimated at 19 billion cubic feet in 1974. The SOGARA refinery at Port Gentil used nearly 8 million barrels (about 1.1 million tons) of crude oil in 1974, and reportedly[12] earned $72 million compared with $32.9 million in 1973 for production of petroleum products. Refinery production was expected to double in 1976 when the second refinery under construction would be completed. The United States, for the first time,[13] imported 3.4 million barrels of crude from Gabon in 1974.

Uranium production, valued at approximately $11.6 million in 1974, increased by about 25% to 1,772 tons of 43.60% contained metal from the 1,412 tons of equivalent material produced in 1973. The sale price of uranium from Gabon was sharply increased in April 1974, and has since been the subject of talks with France. An agreement was signed in May 1974 with the French, increasing the price about five times. Discussions between France and Gabon on uranium matters were expected to reopen in January 1975.

In 1974, Gabon produced 2.1 million tons of metallurgical- and battery-grade manganese, compared with 1.9 million tons in 1973. Production was expected to stay at this level until 1980, when the Trans-Gabon Railroad was planned for completion. More than half of the U.S. imports of manganese was supplied by Gabon and Brazil, with Australia a significant third. Prices for ore, alloy, and manganese metal continued to rise in 1974.

Cement produced by the Cimenterie d'Owendo in 1974 was insufficient for local consumption and a scarcity occurred in June and July. Cimenterie d'Owendo, which utilizes imported clinker, more than doubled production after 1970; from 22,695 tons to 42,526 tons in 1971 and 52,285 tons in 1972. By 1974, 80,000 tons of cement were being produced. An extension to the factory was being planned.

Gold production was down by 35% in 1974 compared with 1973.

[11] Mining Annual Review (New York). Gabon. June 1974, p. 375.
[12] Afrique Industrie Infrastructure (Paris). Gabon. May 1, 1975, p. 15.
[13] The Oil and Gas Journal. Shift Seen in U.S. Crude-Imports Sources. V. 72, No. 52, Dec. 30, 1974, p. 94.

## Table 1.—Gabon: Production of mineral commodities

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| Gas, natural: | | | | |
| Gross production [e] | million cubic feet | 12,000 | 14,000 | 19,000 |
| Marketed production | do | [r] 1,217 | 1,402 | 1,611 |
| Gold, mine output, metal content | troy ounces | 11,413 | 11,221 | 7,298 |
| Manganese: | | | | |
| Ore, 50% to 53% Mn, gross weight | thousand metric tons | 1,903 | 1,877 | 2,059 |
| Pellets, battery and chemical grade, 82% to 85% $MnO_2$, gross weight | do | 34 | 42 | 70 |
| Total | do | 1,937 | 1,919 | 2,129 |
| Petroleum: | | | | |
| Crude | thousand 42-gallon barrels | 45,671 | 55,045 | 73,548 |
| Refinery products: | | | | |
| Gasoline | do | 1,180 | 1,347 | 1,116 |
| Jet fuel and kerosine | do | 724 | 891 | 746 |
| Distillate fuel oil | do | 2,059 | 2,195 | 1,832 |
| Residual fuel oil | do | 2,488 | 2,820 | 2,533 |
| Other | do | 57 | 64 | 56 |
| Refinery fuel and losses | do | 213 | 189 | 1,687 |
| Total | do | 6,721 | 7,506 | 7,970 |
| Uranium oxide ($U_3O_8$) content of concentrate | metric tons | 523 | 646 | 747 |

[e] Estimate. [p] Preliminary. [r] Revised.
[1] In addition to the commodities listed, a variety of crude construction materials (clays, sand, gravel and stone) is also produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

## Table 2.—Gabon: Apparent exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| Chromite | 154 | -- | |
| Copper metal including alloys, all forms | -- | 26 | France 23; Belgium-Luxembourg 3. |
| Iron, ore and concentrate | -- | 24,210 | All to Italy. |
| Manganese ore | 1,273,916 | 1,291,966 | France 645,198; Japan 210,950; United States 183,401; Norway 98,361; Italy 91,902. |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 20,410 | 25,336 | France 9,397; West Germany 6,784; Netherlands 4,312; United Kingdom 4,004. |
| Refinery products, residual fuel oil do | 507 | 775 | United Kingdom 513; United States 141; Sweden 121. |
| Uranium and thorium ores and concentrates | 1,129 | 1,078 | All to France. |

Sources: Statistical Office of the United Nations. 1972 and 1973 editions of World Trade Annual. V's. 1, 2, 3. Walker and Co., New York; and Statistical Offices of the European Communities. 1973 Foreign Trade Analytical Tables, v's. B and I, Luxembourg.

## Table 3.—Gabon: Apparent imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| Aluminum metal and alloys, all forms | [1] | 127 |
| Barite and witherite | 5,039 | 1,890 |
| Cement, hydraulic | 24,116 | 27,641 |
| Clay products: | | |
| Nonrefractory | 987 | 1,409 |
| Refractory | 407 | 801 |
| Copper metal and alloys, all forms | 46 | 44 |
| Iron and steel semimanufactures | 64,050 | 57,070 |
| Petroleum refinery products: | | |
| Lubricants thousand 42-gallon barrels | 15 | 16 |
| Other do | [2] | [2] |
| Sodium and potassium compounds, caustic soda | NA | 440 |
| Other, crude nonmetallic minerals, n.e.s | NA | 227 |

NA Not available.
[1] Unreported quantity valued at US$65,000.
[2] Less than ½ unit.

Sources: Statistical Office of the United Nations, 1972 and 1973 editions of World Trade Annual. V's. 1, 2, 3. Walker and Co., New York.

## COMMODITY REVIEW

### METALS

**Copper.**—Indications of copper occur in the Makokou-Booué area, but investigations have not shown the mineralization to be extensive. Surveys have been made by BRGM west of the Ogooué River, southeast of Etéké, where the geology is presumed similar to that of the Zaire Copperbelt, but no discoveries have been made of commercial importance. Copper indications at Poli that may extend to Maroua and Bibemi were being investigated.

**Gold.**—The State gold authority, Gabonese Mining Exploration and Exploitation Co. (SOGAREM), was continuing its exploration for new deposits to supplement the present workings at Etéké, Lastoursville, Makokou, and Ndjolé. The BRGM has concessions for prospecting between Ndjolé and Lambaréné, and at Etéké.

**Iron Ore.**—The State renounced its plan to acquire 60% of the multinational corporation SOMIFER, reducing its holdings to 56%,[14] and was reportedly favorable to reassigning its interests to new stockholders and to reducing its capital interest eventually to 35%. SOMIFER was expected to begin construction of 19 miles of road to link Massah village on the Makokou-Mékambo road to Belinga, finishing by August 1975. A group of Bethlehem Steel Co. technicians was to arrive in 1975 to begin testing. The tests, which will be carried out over a 2-year period, will determine the exact extent and percentage of impurities in the ore. An analytical laboratory will be installed at Makokou and a liaison office in Libreville.

Iron ore resources in Gabon are estimated[15] to be 1,216 million tons of Precambrian "Lake Superior" type deposits of hematite and accessory goethite and magnetite. Of the eight main deposits, Belinga, Batoala, and Boka-Boka are often described as the Mékambo group. The Mékambo group has a total of 877 million tons estimated reserves, of which the Belinga deposit is the largest. Located on the left bank of the Ivindo River, Belinga has reserves estimated at 566 million tons with 65% Fe, 2.2% $SiO_2$, and 0.12% P. The Minkébé deposit, located northeast of Belinga, has reserves estimated at 60 million tons of 64% Fe, 3% $SiO_2$, and 0.11% P. The Mébaga deposit, located in the northwest section of Mitzic District has resources in the neighborhood of 15 million tons of potential ore with 60% Fe and 4% $SiO_2$. The N'Gama deposit, also in the Mitzic District, contains about 50 million tons of ore with 47% Fe and 22% $SiO_2$. Mela, in the Kango District of western Gabon averages 46% Fe, 30% $SiO_2$, and has resources of 100 million tons. The Tchibanga-Moutéli deposit is located in southwestern Gabon near Tchibanga, and is only 25 miles from the coast. It is a massif of ferruginous quartzites with irregular occurring zones of hematite enrichment and resources estimated at 114 million tons of potential ore with 43% Fe, 27% $SiO_2$, and 0.18% P. Other known iron deposits include the subeconomic iron (120 million tons, 33% $Fe_2O_3$) in the Kribi region, and 450,000 tons of ilmenite at Kribi-Longji and Douala-Souellaba.

**Manganese.**—Gabon was the third largest producer of manganese in the world in 1974; production from the COMILOG mine at Moanda reached 2.1 million tons. Pending completion of the Trans-Gabon Railroad, production was expected to reach 4 million tons per year. Reserves were estimated to be 210 million tons of salable product grading 48% manganese dioxide. COMILOG was owned by the Government (10%), United States Steel Corp. (44.10%), the French BRGM (19.8%), Compagnie de Mokta (17.10%), and the Société Auxiliare du Manganese de Franceville (9%).[16]

**Uranium.**—Negotiations were held during March 1974 between Gabon, Niger, and France regarding the price of uranium, the revenue earned by these States from uranium exploitation and effects derived from this revenue. The sale price was increased, and an agreement was signed in May 1974 between France and Gabon that permitted the French Commissariat à l'Energie Atomique (CEA) to pay market prices for uranium but included

[14] Informations D'Outre Mer (Paris). Belinga Iron Project Underway. Jan. 22, 1975, p. 9.
[15] Survey of World Iron Resources. Gabon. United Nations (New York), 1970, p. 77.
[16] Industries et Travaux D'Outre-Mer (Paris). Le Manganese, Exploitation et Marché Mondial. (Manganese, Exploitation and World Market.) V. 22, No. 249, April 1974, p. 710.

a lump sum payment by France to Gabon to offset loss of earnings resulting from the preferential sale of uranium to France.

The Government purchased 25% of COMUF; the remainder is owned by Compagnie de Mokta, the French CEA, and Société Minière Péchiney-Mokta.

Gabon's uranium reserves are estimated at 20,600 tons of metal. The ore is among the purest known and has a content between 8.8 and 11 pounds of metal per ton (0.4% to 0.5%). The discovery in September 1972 of a natural atomic pile excited the curiosity of scientists, and in 1974 was the subject of a research bulletin by the CEA,[17] which included papers by several authors. Prospecting was on the increase; COMUF and the CEA pursued a large-scale prospecting program in the southeast near Franceville, in the east near Okondja, and on the coast near Coco Beach, where core reportedly will be taken from as deep as 3,281 feet below ground level. C. Itoh & Co., Ltd. (Japan) joined Dowa Mining Co., Ltd. and Okura Trading Co., Ltd. in prospecting in mid-western Gabon.[18]

## NONMETALS

**Cement.**—In 1974, Gabon suffered a shortage of cement, prompting a renewal of plans for building a cement factory using the high-grade calcium deposits occurring on the Isle of Coniquet in the Gabon estuary. A capacity of 200,000 tons of cement per year was visualized. The Government increased its participation in the Société des Ciments d'Owendo to 51% during 1974.

**Fertilizer Materials.**—*Phosphate.*—A discovery of submarine Neogene phosphatic deposits was made in 1971 and 1972 during dredging along the Continental Plateau. Both phosphate-covered pebbles and fluorapatite coproliths were described in a 1973 report[19] as situated between depths of 262 and 328 feet. Economic evaluation of deposits was not possible.

**Stone.**—*Marble and Granite.*—A cutting and finishing factory for marble and granite quarried in south Gabon was established in 1973. In 1974, the Gabon Government acquired a $1.6 million interest in SOGAMAR. Marble for the factory was derived from the 10-million-ton estimated reserve located at Tchibanga.

## MINERAL FUELS

**Natural Gas.**—Reserves were estimated at 6.5 trillion feet of natural gas. Natural gas production in 1973 was up about 16.6% over that of 1972, and in 1974 increased 35.7%. Cumulative gas production in 1974 was 224.5 billion cubic feet[20] for 10 producing African States, and 19 billion cubic feet for Gabon. A factory for the industrial use of natural gas was also planned.

**Petroleum.**—Requirements for a company seeking oil in Gabon were listed as follows:[21] A local company must be formed of which the Government will take 12% participation, with possible subsequent purchasing to 60%. Corporate income tax rate is 55% with allowances that can bring the rate down. In 1974, Gabon agreed to modify Elf-Gabon's tax basis so that the Government received 55% of profits on the posted price of $7 per barrel of crude oil. However, the 15% discount, which had been allowed to cover cost of shipping to the port of embarkation, was cut back to 5%. Royalties due the Government are based on the price of crude and are 12.5% on 95% of f.o.b. price. New producing companies must make available 25% of their production for sale to the National Oil Refinery at Port Gentil, and up to 25% of local crude production must be transported by Gabonese flag vessels.

Total proved oil reserves were 1.25 billion barrels. A total of 137 wells were flowing, with a total cumulative production to November 1, 1974, of 308,253,657 barrels.[22] The largest producers were the Gamba (since 1963) with 98.6 million barrels, Anquille Marine (since 1962) with 57 million barrels, and Ivinga (since 1967) with 40.6 million barrels. Production from the Lucina, Barbier, Girelle,

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[17] Bulletin d'Information Scientifique et Technique du Commissariat à l'Energie Atomique (Bulletin of Scientific and Technical Information of the Atomic Energy Commission). (Paris). No. 193, June 1974.

[18] American Metal Market. Uranium Exploration. V. 82, No. 6, Jan. 9, 1975, p. 8.

[19] Cornen, G., P. Giresse, and G. S. Odin. Découverte de dépôts phosphatés néogènes sousmarins sur les plateaux continentaux du Sud du Gabon et du Nord du Congo. (Discovery of Submarine Neogene Phosphatic Deposits on the Continental Platform of South Gabon and North Congo.) Geol. France Compte Rendu. No. 1, 1973, pp. 9–11.

[20] Oil and Gas Journal. Gabon. V. 72, No. 52, Dec. 30, 1974, p. 191.

[21] U.S. Embassy, Libreville, Gabon. State Department Airgram A–058, July 23, 1974, 7 pp.

[22] Work cited in footnote 20.

Merous, and Mandaros finds began in 1974. Barbier was linked up to a 20-inch pipeline already taking production from Grondin and Torpille (started in 1972) to the Cap Lopez export terminal. Grondin (started in 1973) was expected to increase production in early 1975, and was reportedly producing 70,000 barrels per day in 1974. The Shell-Lucina discovery tested 2,300 barrels per day in 1972; the oil is 37° API, low-sulfur, medium-pour point. Development of the Breme Field was underway, and Ocean Oil and Gas Co. was expected to put its Doree well into production at 1,000 barrels per day in early 1975. Elf-Gabon had three drilling rigs operating on the Barbier Marine, Breme Marine, and Grondin Madroo Marine structures. Two offshore drills were operating on the Sette Cama lease for Shell-Gabon. Shell had a number of permits expiring at yearend 1974, and spent some $15 million on offshore work. Six million dollars was spent on drilling a dry well from the drillship *Sedco 445* in 2,150 feet of water. Shell was also operating another drillship. Elf-Gabon reportedly spent on estimated $25 million on exploration, double the 1973 estimate.

In 1975, prospecting was expected to be done mainly on land in Ogooué where four Cie. Générale de Géophysique (CGG) teams were to carry out seismic studies. Other companies holding exploration permits, in partnerships with one or more of those listed, included Gulf Oil Company of Gabon, Mitsubishi of Japan, Gabon Petroleum Corp., Ashland Petroleum Company, Gabon Corp., Valmar Construction Corp., Mesa Oil Co., Texaco of Gabon, Chevron Oil Co., Tennessee Oil and Gas Co. Inc. (Tenneco), Continental Oil Co., Ocean Drilling and Exploration Co. (ODECO), Ocean Oil and Gas Co., Oceanic Exploration Co., Canadian Bonanza Ltd., Diamond Shamrock Oil Company Ltd., Grace Petroleum Co., and Exxon Corporation.

Oil production necessitated the building of a terminal at Cap Lopez where tanks were installed with a storage capacity of 1.3 million barrels; three more 310,559-barrel tanks were to be setup. A new loading dock that will take 250,000-ton supertankers was planned for yearend 1975. Cap Lopez was expected to be the biggest oil storage facility in Gabon, backed up by Gamba and Batanga terminals to the south. Gabon was also starting tanker operations. Elf-Gabon's 140,000-deadweight ton crude carrier *N'Tchingue,* launched in Sweden in September 1974, was under Gabonese flag.

Export of refined products from the 17,400-barrel-per-day SOGARA refinery was being planned as production was expected to be doubled by 1976. PIZO (after the Bakota word for energy), a national company for the distribution of petroleum products, was established with the Government owning 51% and the remainder divided between Shell, Elf, and AGIP S.p.A. It was to begin operations in 1975. The company was established to enable Gabon to comply with OPEC policies and control the distribution as well as the exploitation of its oil. Other private distribution companies, notably Texaco and Mobil, will continue to operate in Gabon.[23] The Government expressed interest in increasing participation in Elf-Gabon to 25%, and talks on the matter were to be held in 1975.

[23] U.S. Embassy, Libreville, Gabon. State Department Airgram A-058, July 23, 1974, 7 pp.

# The Mineral Industry of East Germany

By Joseph B. Huvos [1]

East Germany's mineral industry is closely linked to that of East Europe and the Soviet Union. The centrally controlled economy of East Germany is based on mutually coordinated production schedules, and plan targets are predetermined by the 1971–75 national plan for economic development. By world standards East Germany had no significant mineral resources besides lignite and potash, for which the country was the world's first and third largest producer, respectively. Much of the remainder of the country's mineral requirements had to be imported.

Compared with 1973 production, pig iron has increased 78,000 tons; crude steel 274,000 tons; nitrogen fertilizer, 49,000 tons; and potash, 309,000 tons. Natural gas output increased 48.1 billion cubic feet, and electric power 3,372 million kilowatthours. There were also increases in the output of phosphatic fertilizers, manufactured gas, oil refinery products, and petrochemicals.

Beside gains in mineral production as reported in the official press, there have been also reports of failures to reach planned goals and to eliminate shortages in the supply of energy and materials. This focused attention on more intense campaigns for saving materials and energy.

As in the past, expansion of the mineral industry was achieved mainly through increased use of capital. Though East Germany's industry is better developed than that of most countries in East Europe, plant and equipment was often not up to date and failed to match efficiencies achieved in West Germany.

There are about 195,000 persons employed in the fuel industry including mining; about 345,000 in the chemical industry including petroleum; and about 124,000 in the metallurgical industry. There was also a constant shortage of labor in the country, and some industrial projects were built with the help of "guest" workers from neighboring East European countries.

While trade unions in Western countries are mainly wage-bargaining organizations, East German unions, similar to those in other East European countries have as a purpose to promote labor productivity and achievement of plan targets. Average monthly earnings of East German workers and employees in industry were about 870 marks [2] in 1974, or an increase of 2.7% over that of 1973.

As East German territory has been already well explored for mineral resources, prospecting was centered mainly on further delineation of lignite deposits for new mines and on development of existing oil and gas resources.

In 1974, a number of mines and plants were commissioned. New large scale lignite units that became operational during the year, were at the opencast lignite mines of Nochten, Welzow-Süd and Profen-Süd.

In the electric power generating industry two 440-megawatt nuclear-powered generating units went onstream at the Bruno Leuschner plant and two conventional 210-megawatt units were commissioned at the Boxberg powerplant.

In the iron and steel industry, new surface treatment plants for strip and profiles were commissioned at the steel strip combine in Eisenhüttenstadt. At Nachterstedt a continuous casting unit for aluminum strip was commissioned.

In the fertilizer materials industry, new capacities went onstream producing ammonia and urea at the Piesteritz nitrogen works.

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[1] Foreign mineral specialist, Division of Coal.

[2] Values have not been converted from East Germany currency units (marks) to U.S. dollars owing to fluctuating exchange rates. The official East German exchange rate not recognized by the International Monetary Fund was 2.30 marks = US$1.00.

## PRODUCTION

Mineral production statistics were not officially reported for a number of commodities. Therefore, many of the data in table 1 were estimated.

Reportedly 58 mineral products were produced in the country. A comparison of actual production increases with planned increases for the few mineral products for which 1974 plan figures were published [3] follows: Potash production increased 12.1% (planned increase 12.1%); nitrogen fertilizer, 11.9% (planned 14.6%); manufactured gas, 1.8% (planned 3.9%); natural gas, 19.6% (planned 19.1%); petroleum products, 6.7% (planned 12.2%), and cement 5.8% (planned 8.8%).

Besides a reported 7.4% increase in the volume of industrial production, there remained several problems hampering output and productivity, such as chronic shortages of energy softened only during the year by favorable weather conditions; shortages of spare parts; and shortages of railroad cars and trucks.

[3] Neues Deutschland (East Berlin). Dec. 21, 1973, p. 2.

**Table 1.—East Germany: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| **METALS** | | | | |
| Aluminum: | | | | |
| Alumina | | 45,140 | 47,267 | • 47,267 |
| Metal, primary [e] | | [r] 55,000 | [r] 70,000 | 70,000 |
| Cadmium metal, primary [e] | | 16 | 16 | 18 |
| Copper: | | | | |
| Mine output, metal content [e] | | 3,000 | 1,500 | -- |
| Smelter output [e] | | 2,400 | 1,500 | -- |
| Refinery output [e] | | 40,000 | 42,000 | 46,000 |
| Iron and steel: | | | | |
| Iron ore, gross weight [2] | thousand tons | 268 | 52 | -- |
| Pig iron | do | 2,151 | 2,202 | 2,280 |
| Crude steel | do | 5,670 | 5,892 | 6,166 |
| Steel semimanufactures (rolled products, forgings and pressings) | do | 3,708 | 3,876 | • 4,000 |
| Lead: | | | | |
| Mine output, metal content [e] | | 7,000 | 7,000 | 4,000 |
| Metal, refined including secondary [e] | | 20,000 | 20,000 | 20,000 |
| Nickel [e] | | 1,200 | 1,200 | 1,300 |
| Silver, mine output, metal content [e] | thousand troy ounces | 5,000 | [r] 4,000 | 3,000 |
| Tin: | | | | |
| Mine output, metal content [e] | long tons | 1,000 | 1,000 | 1,000 |
| Metal including secondary [e] | do | 1,180 | 1,200 | 1,200 |
| Zinc: | | | | |
| Mine output, metal content [e] | | 8,000 | 6,000 | 5,000 |
| Metal including secondary [e] | | 15,000 | 18,000 | 18,000 |
| **NONMETALS** | | | | |
| Barite [e] | | 30,000 | 31,000 | 31,000 |
| Boron minerals, processed borax, $Na_2B_4O_7 \cdot 10H_2O$ content | | 3,705 | 4,000 | • 4,000 |
| Cement, hydraulic | thousand tons | 8,857 | 9,548 | 10,102 |
| Chalk | do | 41 | 45 | • 48 |
| Fertilizer materials, manufactured: | | | | |
| Nitrogenous, N content: | | | | |
| Ammonium sulfate | do | 171 | 159 | • 178 |
| Calcium ammonium sulfate | do | 188 | 179 | • 200 |
| Unspecified | do | 69 | 73 | • 82 |
| Total | do | 428 | 411 | 460 |
| Phosphatic, $P_2O_5$ content: | | | | |
| Superphosphate | do | 210 | 205 | • 209 |
| Calcined phosphate | do | 112 | 116 | • 118 |
| Thomas slag | do | 14 | 14 | • 14 |
| Unspecified | do | 73 | 68 | • 69 |
| Total | do | 409 | 403 | 410 |
| Potassic, marketable potash, $K_2O$ equivalent | do | 2,458 | 2,556 | 2,865 |
| Fluorspar | do | 80 | 90 | • 90 |
| Gypsum and anhydrite: | | | | |
| Crude [e] | do | 340 | 340 | 340 |
| Calcined | do | 290 | 289 | • 289 |

See footnotes at end of table.

## Table 1.—East Germany: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Lime and dead-burned dolomite | thousand tons | 2,935 | 3,029 | [e] 3,100 |
| Pyrite: | | | | |
| Gross weight [e] | do | 140 | 140 | 140 |
| Sulfur content [e] | do | 58 | 58 | 58 |
| Salt: | | | | |
| Marine | do | 50 | 51 | [e] 51 |
| Rock | do | 2,137 | 2,236 | [e] 2,225 |
| Total | do | 2,187 | 2,287 | [e] 2,276 |
| Sodium carbonate | | 720,670 | 779,971 | [e] 800,000 |
| Sodium sulfate | | 186,144 | 187,319 | [e] 187,319 |
| Stone, sand and gravel: | | | | |
| Crushed stone | thousand tons | 10,675 | 11,315 | [e] 11,800 |
| Sand and gravel | do | 7,701 | 7,731 | [e] 7,731 |
| Sulfur: | | | | |
| Elemental | do | 88 | 90 | [e] 90 |
| Sulfuric acid | do | 1,045 | 1,058 | 1,005 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Coal: | | | | |
| Bituminous | do | 815 | 753 | [e] 600 |
| Lignite | do | 248,451 | 246,245 | [e] 246,245 |
| Total | do | 249,266 | 246,998 | [e] 246,845 |
| Coke: | | | | |
| From anthracite and bituminous coal | do | 1,605 | 1,856 | [e] 1,856 |
| From brown coal: | | | | |
| High temperature | do | 1,944 | 1,875 | [e] 1,875 |
| Low temperature | do | 3,794 | 3,864 | [e] 3,864 |
| Total | do | 7,343 | 7,595 | [e] 7,595 |
| Fuel briquets (from lignite) | do | 50,801 | 50,154 | [e] 50,154 |
| Gas: | | | | |
| Manufactured | million cubic feet | 169,298 | 170,004 | 173,112 |
| Natural, marketed production [3] | do | 183,635 | [e] 245,000 | 293,110 |
| Petroleum: | | | | |
| Crude [e] | thousand 42-gallon barrels | 2,300 | 2,500 | 2,500 |
| Refinery products: | | | | |
| Gasoline | do | 21,311 | 23,262 | NA |
| Kerosine, jet fuel, and distillate fuel oil | do | 28,768 | 30,431 | NA |
| Residual fuel oil | do | 40,033 | 44,366 | NA |
| Lubricants | do | 2,496 | 2,507 | NA |
| Asphalt | do | 4,598 | 5,012 | NA |
| Total [4] | do | 97,206 | 105,578 | [e] 112,600 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, magnesium, peat and a variety of crude nonmetallic construction materials (clays and stone) are produced, but output is not reported, and available general information is inadequate to permit formulation of reliable estimates of output levels.

[2] Source indicates that data include "roasted ore"; presumably roasted pyrite.

[3] Gross production of natural gas is not reported, but presumably it is only slightly greater than reported marketed gas.

[4] Total of reported figures only; no estimates have been made for unreported products and/or refinery fuel and losses.

## TRADE

In 1973, reference year for this chapter's trade tables, East Germany's exports of all goods amounted to 26.2 billion marks, an increase of 2.3 billion compared with that of 1972; imports were 27.3 billion, an increase of 4.4 billion over those of 1972. In 1972, the value of mineral related commodity exports comprised 22.4% of all exports, an increase of 1.3%; mineral imports comprised 31.7% of all commodities imported, a decrease of 2.1% compared with that of 1972. In 1973, East Germany's principal trading partners, in order of importance of trade volume, with respective values of exports and imports in billion marks shown in parentheses, were as follows: the U.S.S.R. (9.9; 8.6), Czechoslovakia 2.6; 2.4), Poland (2.6; 2.2), West Germany (1.8; 2.3), and Hungary (1.2; 1.6). The value of total East German commodity trade with various groups of countries in 1971, 1972, and 1973 was as follows:

| Countries | Value (billion mark) | | |
|---|---|---|---|
| | 1971 | 1972 | 1973 |
| COMECON[1] | 28.4 | 31.7 | 35.3 |
| Other East European | 1.8 | 1.5 | 1.5 |
| Total East European and U.S.S.R | 30.2 | 33.2 | 36.8 |
| All other developed countries | 9.9 | 12.0 | 14.9 |
| All other developing countries | 1.7 | 1.5 | 1.8 |
| Total all other developed and developing countries | 11.6 | 13.5 | 16.7 |
| Grand total | 41.8 | 46.7 | 53.5 |

[1] COMECON (CMEA)—Council for Mutual Economic Assistance comprising the following countries: Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the U.S.S.R.

In 1973 East Germany traded with 49 countries. More than two-thirds of its trade, however, was with East Europe and the U.S.S.R. The share of East German trade with these countries decreased from 71.1% in 1972 to 68.8% in 1973. East Germany's major trading partners are the COMECON countries. Trade with these countries decreased from 67.9% of total trade in 1972 to 66.0% in 1973. Quantitatively there was no significant change in the pattern of East Germany's mineral trade in 1973 compared with that in 1972. Exports of mineral commodities were small. Only exports of potash and fuel briquets were significant. There was a decrease in East Germany's exports of petroleum products, potassium, salt, gypsum, and kaolin.

The most important categories of mineral commodity imports were those of crude oil and petroleum products, manufactured and natural gas, bituminous coal, coke, phosphate rock, apatite concentrate, asbestos, mica, alumina, carbon black, nitrogenous fertilizers, phosphatic fertilizers, iron ore, ferroalloys, raw steel and semiproducts, bauxite, aluminum semimanufactures, graphite, and kaolin. The most important suppliers were the U.S.S.R. and the East European countries.

## Table 2.—East Germany: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal destinations, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Oxide and hydroxide | -- | 3,062 | All to Finland. |
| Metal including alloys: | | 7,651 | Netherlands 5,121; Sweden 2,530. |
| Scrap | r 9,949 | | |
| Unwrought | 830 | 3,485 | Yugoslavia 2,475; United Kingdom 540. |
| Semimanufactures [3] | r 395 | 1,413 | Yugoslavia 620; Hungary 398; Poland 395. |
| Chromite | -- | 5,141 | All to Spain. |
| Chromium oxide ---- value, thousands | $51 | NA | |
| Copper metal including alloys: | | | |
| Scrap | 919 | 157 | All to Netherlands. |
| Unwrought | r 2,365 | 211 | All to United Kingdom. |
| Semimanufactures | r 132 | 47 | All to Austria. |
| Iron and steel metal: | | | |
| Scrap [3] ---------- thousand tons | 26 | 20 | Poland 16. |
| Pig iron, ferroalloys and similar material [4 5] ---------- do | r 309 | 2,042 | Hungary 1,866. |
| Steel, primary forms [3] ------ do | r 95 | 115 | Belgium-Luxembourg 44; Poland 34; Yugoslavia 18. |
| Steel, semimanufactures [3 5] -- do | r 218 | 261 | Poland 89; France 36; Yugoslavia 29. |
| Lead: | | | |
| Oxides | 1,983 | 1,115 | France 670; Denmark 260; Sweden 185. |
| Metal including alloys: | | | |
| Scrap | 364 | 316 | All to United Kingdom. |
| Unwrought and semimanufactures [3] | r 4,466 | 4,540 | Netherlands 2,519; Austria 700; Spain 671. |
| Magnesium | 145 | NA | |
| Nickel metal including alloys | 53 | 39 | All to Netherlands. |
| Platinum-group metals and silver: | | | |
| Platinum group - value, thousands | r $100 | $79 | Do. |
| Silver ---------- do | $780 | $448 | Do. |
| Tin metal including alloys, all forms [3] long tons | 328 | NA | |
| Zinc: | | | |
| Oxides | 1,983 | 1,525 | Norway 865; France 460; Denmark 200. |
| Metal including alloys: | | | |
| Scrap | r 934 | 2,113 | France 1,326; United Kingdom 615. |
| Unwrought including semimanufactures | r 1,837 | 1,515 | Poland 1,289; Belgium-Luxembourg 176. |
| Other, metal-bearing slag, ash, similar residues | 15,677 | 16,834 | Austria 14,315; Netherlands 1,982. |
| **NONMETALS** | | | |
| Abrasives, grinding and polishing wheels and stones | 39 | NA | |
| Barite [3] | 9,979 | 9,996 | All to Poland. |
| Cement | 32,712 | 8,499 | All to Yugoslavia. |
| Chalk [6] | 41,184 | 45,148 | NA. |
| Clays and clay products: | | | |
| Kaolin [6] | 105,334 | 90,459 | Yugoslavia 11,717; Hungary 9,160. |
| Products: | | | |
| Nonrefractory | r 9,085 | 7,831 | Belgium-Luxembourg 3,977; Denmark 2,237. |
| Refractory | 8,513 | 7,395 | Belgium-Luxembourg 4,040; Yugoslavia 3,318. |
| Diamond, industrial --value, thousands | $144 | $147 | All to Belgium-Luxembourg. |
| Feldspar and fluorspar [3] | r 36,874 | 37,434 | Poland 23,919; Austria 7,191; Yugoslavia 3,031. |
| Fertilizer materials: | | | |
| Nitrogenous, manufactured [4] | r 599 | 6,031 | All to Hungary. |
| Phosphatic, manufactured (gross weight) ---------- thousand tons | -- | 6 | All to Netherlands. |
| Potassic, crude and manufactured, $K_2O$ equivalent [7] ---------- do | 1,820 | 1,819 | Poland 503; Czechoslovakia 446. |
| Gypsum, calcined [6] | 92,968 | 84,683 | NA. |
| Mica, worked | r 9 | NA | |
| Salt, rock [6] ---------- thousand tons | 910 | 879 | Czechoslovakia 695. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 500 | 599 | All to Finland. |
| Caustic potash, sodium and potassium peroxides [6] | r 11,424 | 9,643 | NA. |
| Soda ash [8] -------- thousand tons | 48 | 54 | All to Czechoslovakia. |

See footnotes at end of table.

## Table 2.—East Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel: | | | |
| Dimension stone, crude and partly worked | r 1,132 | NA | |
| Gravel and crushed rock: [6] | | | |
| Gravel ---- thousand tons | 740 | 680 | NA. |
| Crushed rock ---- do | 18 | 205 | NA. |
| Sand, excluding metal bearing ---- do | 20 | NA | |
| Sulfur, elemental [3] ---- do | 59 | 62 | All to Poland. |
| Other nonmetals, n.e.s | r 27,566 | 13,649 | United Kingdom 8,764; Norway 4,660. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black [6 7] | 8,700 | 10,300 | United Kingdom 1,915; U.S.S.R. 1,000. |
| Coal, brown coal briquets [6] thousand tons | 2,486 | 2,255 | West Germany 878; Czechoslovakia 585. |
| Coke | 4,674 | NA | |
| Gas (natural or manufactured, not specified [3 6] ---- million cubic feet | 735 | 802 | Poland 189. |
| Petroleum refinery products: | | | |
| Gasoline [6] thousand 42-gallon barrels | 5,154 | 6,352 | NA. |
| Distillate fuel oil [6] ---- do | 6,404 | 5,056 | Sweden 971. |
| Residual fuel oil ---- do | r 773 | 443 | Denmark 272; Austria 110; Sweden 61. |
| Lubricants ---- do | 1 | 24 | Austria 18; Greece 3; Yugoslavia 3. |
| Other: | | | |
| Mineral jelly and wax ---- do | 462 | 521 | West Germany 105. |
| Unspecified ---- do | 6 | NA | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | r 4,923 | 2,957 | France 2,134; Italy 823. |

r Revised. NA Not available.

[1] Compiled from the 1972 edition of the Supplement to the World Trade Annual, Walker and Company, New York, 1974, unless otherwise specified.

[2] Compiled from the 1973 edition of the World Trade Annual, vs. 1–3, Walker and Company, New York, 1975.

[3] Source: Polish trade statistics.

[4] Source: Hungarian trade statistics.

[5] Source: Bulgarian trade statistics.

[6] Source: East German trade statistics.

[7] Source: U.S.S.R. trade statistics.

[8] Source: Czechoslovakian trade statistics.

## Table 3.—East Germany: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite [3] ---- thousand tons | 268 | 266 | Hungary 179; Yugoslavia 62. |
| Alumina, $Al_2O_3$ content [3] | 96,897 | 83,467 | West Germany 63,179. |
| Metal including alloys: | | | |
| Unwrought [4 5] | r 113,174 | 114,232 | U.S.S.R. 110,080. |
| Semimanufactures, (rolled) [3] | 29,400 | 29,000 | Hungary 3,621. |
| Cadmium metal including alloys | 211 | 193 | All from U.S.S.R. |
| Chromium, chromite, $Cr_2O_3$ content [3] | 55,100 | 39,100 | U.S.S.R. 31,000. |
| Copper: | | | |
| Ore and concentrate | r 18,779 | 17,677 | All from Sweden. |
| Metal including alloys: | | | |
| Scrap | 396 | 266 | United States 141; Belgium-Luxembourg 75. |
| Unwrought | 2,389 | 2,650 | All from Ireland. |
| Semimanufactures | 315 | 333 | United Kingdom 148; Belgium-Luxembourg 85. |
| Iron and steel: | | | |
| Iron ore, gross weight [3] thousand tons | 1,601 | 1,775 | U.S.S.R. 1,500. |
| Scrap [6] ---- do | 15 | 320 | U.S.S.R. 211; Poland 109. |
| Pig iron [3] ---- do | 700 | 814 | Mainly from U.S.S.R. |
| Ferroalloys [3 7] ---- do | 17 | 17 | U.S.S.R. 4. |
| Steel semimanufactures: [3] | | | |
| Bars and rods ---- do | 605 | 639 | U.S.S.R. 414. |
| Angles, shapes and sections ---- do | 559 | 475 | NA. |
| Hot and cold rolled strip ---- do | 282 | 297 | NA. |
| Light plates and sheets ---- do | r 61 | 60 | NA. |
| Heavy plates and sheets ---- do | 498 | 552 | U.S.S.R. 497. |
| Pipes ---- do | 273 | 298 | Poland 109; U.S.S.R. 98. |
| Rails and accessories ---- do | 494 | 344 | U.S.S.R. 329. |
| Lead oxide | 1,983 | NA | |
| Metal, unwrought and semimanufactures | r 49,466 | 47,430 | US.S.R. 44,983. |
| Scrap | 364 | NA | |
| Magnesium, unwrought, unalloyed | [3]3,100 | 3,004 | All from U.S.S.R. |
| Manganese ore: [4] | | | |
| Metallurgical grade thousand tons | 172 | 165 | Do. |
| Battery and chemical grade ---- do | 2 | 2 | Do. |
| Mercury ---- 76-pound flasks | r 2,263 | 4,641 | Spain 2,843; Italy 1,798. |
| Nickel metal, all forms | 51 | NA | |
| Platinum, unworked value, thousands | $47 | NA | |
| Silver, unworked or partly worked ---- do | r $7,083 | $6,160 | United Kingdom $4,134; Spain $2,026. |
| Tin metal including alloys, unwrought ---- long tons | 143 | NA | |
| Titanium oxide [3] | r 9,588 | 9,635 | West Germany 7,680; Finland 1,955. |
| Tungsten, metal | -- | 3 | All from Austria. |
| Zinc: | | | |
| Ore and concentrate | 1,806 | NA | |
| Oxide | 2,448 | 300 | All from Yugoslavia. |
| Metal, including alloys, all forms [4 6] | r 44,271 | 42,006 | U.S.S.R. 40,717. |
| Other: | | | |
| Ores and concentrates of molybdenum, tantalum, titanium, vanadium, zirconium | -- | 332 | Belgium-Luxembourg 259, United States 73. |
| Metals including alloys, all forms: | | | |
| Metalloids | 85 | NA | |
| Base metals and alloys, all forms, n.e.s | 76 | 174 | Belgium-Luxembourg 160. |
| Ash and residues containing nonferrous metals | 15,677 | NA | |
| **NONMETALS** | | | |
| Abrasives, natural: | | | |
| Dust and powder of precious and semiprecious stones, except diamond ---- value, thousands | r $128 | $53 | All from Belgium-Luxembourg. |
| Grinding wheels and stones | 248 | 152 | All from Sweden. |
| Asbestos [3] | 59,657 | 51,691 | U.S.S.R. 38,700. |
| Cement [4] | r 177,681 | 132,522 | U.S.S.R. 130,000. |

See footnotes at end of table.

## Table 3.—East Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Clays and clay products: | | | |
| Crude clays: | | | |
| Bentonite [5] | 6,434 | 16,117 | All from Hungary. |
| Kaolin [3] | 25,342 | 25,894 | United Kingdom 14,394; Yugoslavia 3,886. |
| Other | 5,036 | 14,904 | All from Poland. |
| Products: | | | |
| Nonrefractory | 8,513 | NA | |
| Refractory | r 9,085 | 3,841 | United Kingdom 1,972; France 1,351; Netherlands 518. |
| Diamond: | | | |
| Industrial ... value, thousands | r $1,837 | $1,743 | All from Belgium-Luxembourg. |
| Gem ... do | $73 | $78 | Do. |
| Feldspar and fluorspar | 22,897 | 20,963 | Norway 8,425; Sweden 6,200; Yugoslavia 3,301. |
| Fertilizer materials: | | | |
| Crude, phosphate rock and apatite concentrates, $P_2O_5$ content [3] thousand tons | 517 | 500 | U.S.S.R. 431. |
| Manufactured: | | | |
| Nitrogenous, N content [3] ... do | 238 | 237 | West Germany 39. |
| Phosphatic, $P_2O_5$ content [3] ... do | r 61 | 47 | West Germany 35. |
| Ammonia | -- | 1,496 | All from France. |
| Graphite [3 4] | 6,569 | 5,376 | U.S.S.R. 2,388. |
| Lime [6] | 1,369 | 1,582 | All from Poland. |
| Magnesite, crude, calcined and sintered [8] ... thousand tons | 37 | 26 | All from Czechoslovakia. |
| Mica [3] | 1,259 | 1,490 | India 265. |
| Pigments, mineral, including iron oxides | r 447 | 531 | France 451; Belgium-Luxembourg 80. |
| Precious and semiprecious stones, except diamond ... value, thousands | r $207 | NA | |
| Stone, sand and gravel, crushed stone | 2,084 | 480 | All from Yugoslavia. |
| Sulfur: | | | |
| Elemental, all forms [3] | 51,980 | 72,156 | Poland 62,950. |
| Sulfuric acid [4 6 9] | 55,804 | 80,878 | Poland 40,901; U.S.S.R. 39,977. |
| Talc and related materials | 3,491 | 1,623 | All from Austria. |
| Other: | | | |
| Slag, dross and similar waste | 14,707 | NA | |
| Other nonmetallic minerals, n.e.s | -- | 636 | All from Netherlands. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black [3] | 30,200 | 29,200 | U.S.S.R. 22,570; Romania 6,100. |
| Coal: | | | |
| Anthracite and bituminous [3] thousand tons | 7,601 | 8,341 | U.S.S.R. 4,801; Poland 1,880; Czechoslovakia 707. |
| Lignite [6] ... do | r 4,401 | 5,022 | All from Poland. |
| Coke [3] ... do | 3,077 | 3,199 | U.S.S.R. 1,065; Poland 955; Czechoslovakia 807. |
| Gas, manufactured [3] million cubic feet | 162 | 27,909 | NA. |
| Petroleum: | | | |
| Crude [3] thousand 42-gallon barrels | r 109,011 | 117,846 | U.S.S.R. 95,734; Netherlands 10,333. |
| Refinery products: | | | |
| Gasoline ... do | 14 | 10 | All from Yugoslavia. |
| Distillate fuel oil ... do | 414 | 240 | All from Netherlands. |
| Lubricants ... do | 2 | 99 | Romania 97. |
| Other: | | | |
| Coke [10] ... do | 18 | 28 | All from Romania. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals [4] | 4,953 | 66,481 | All from U.S.S.R. |

r Revised. NA Not available.

[1] Compiled from the 1972 edition of the Supplement to the World Trade Annual, Walker and Company, New York, 1974, unless otherwise specified.

[2] Compiled from the 1973 edition of the World Trade Annual, Walker and Company, New York, 1975 unless otherwise specified.

[3] Source: East German trade statistics.

[4] Source: U.S.S.R. trade statistics.

[5] Source: Hungarian trade statistics.

[6] Source: Polish trade statistics.

[7] The previous edition erroneously reported 16,700,000 and 17,000,000 as 16,700 and 17,000 tons, respectively.

[8] Source: Czechoslovakian trade statistics.

[9] Source: Bulgarian trade statistics.

[10] Source: Romanian trade statistics.

## COMMODITY REVIEW

### METALS

East Germany's metals industries are based mainly on imported raw materials, since East Germany has only very limited domestic metal resources of its own. In 1974 East Germany imported most of its iron ore and nonferrous metals and all of its bauxite and alumina requirements.

**Aluminum.**—East Germany operated two reduction plants with a total probable capacity of 90,000 tons per year. Although no exact production figures were available, the output of primary metal was estimated at 70,000 tons in 1974, the same as that in 1973. At present most of East Germany's primary aluminum comes from the Bitterfeld electrochemical combine, estimated to have a capacity of about 65,000 tons per year; and from the Lauta aluminum works with 25,000 tons per year. In 1974 East Germany also imported 109,900 tons of aluminum from the U.S.S.R. and an estimated 29,000 tons of semiproducts.

The estimated aluminum supply position in 1974 was as follows, in thousand tons:

| | |
|---|---|
| Production of primary aluminum | 70,000 |
| Imports | 110,000 |
| Exports | -- |
| Apparent consumption | 180,000 |

East Germany's only alumina plant is also located at VEB Chemiewerke Lauta. The plant produced an estimated 47,267 tons in 1974, unchanged compared with that of 1973. The plant used bauxite imported mainly from Hungary (179,000 tons) and from Yugoslavia (62,075 tons) in 1973. Some of the bauxite imported from Hungary may have been reexported to the U.S.S.R. To complement the alumina produced domestically, East Germany imported significant quantities in 1973: (84,467 tons) of which Hungary provided 21,281 tons. The Lauta aluminum works was modernized and plans have been made to raise alumina and ingot capacity by 140% and 265%, respectively.

Building of a larger processing plant has started at the Nachterstedt light metal works for the production of ultra-thin aluminum sheets. The 120-million-mark project was built in cooperation with the U.S.S.R. and other East European countries. The cold-rolling equipment will be supplied by the Ernst Thaelmann heavy machinery construction combine in Magdeburg.

Production started at a second section of the reduction plant of the Bitterfeld chemical combine. Forty-eight reduction cells are onstream and the plant is said to have reached its planned capacity.[4]

**Cadmium.**—In 1974 East Germany's estimated cadmium output was 18 tons, an increase of 12.5% over that of 1973. The cadmium is recovered mainly as a byproduct from the smelting of zinc and other nonferrous metals at the Wilhelm Pieck combine in Eisleben and the Elektro works in Weida, Thuringia.

**Copper.**—In 1974 East German secondary copper production was estimated to be 46,000 tons, an increase of 9.5% over that of 1973. No primary copper was produced as the Manfeld-Eisleben-Hettstedt (Anhalt) copper deposits were virtually exhausted and the mines were closed. A new deposit was being developed simultaneously at an adjacent location at Sängerhausen.

Work continued on modernizing East Germany's copper smelters at Eisleben and Helbra (August-Bebel-Hütte). Natural gas was introduced in the copper smelting plants in 1974.

In 1974 East German copper consumption was an estimated 95,000 tons. To satisfy demand, East Germany had to import half of this quantity in the form of blister and the other half as refined metal. No official data have been published about East German copper imports, but in the past most copper was known to have been imported from the U.S.S.R.

**Iron and Steel.**—With a production of 6.2 million tons of crude steel in 1974, East Germany contributed 0.8% to world steel production. Output of pig iron increased by 78,000 tons over that of 1973; steel increased by 274,000 tons; semimanufactures (rolled products, forgings, and pressings) increased by 124,000 tons. Production did not satisfy demand, therefore large quantities had to be imported, much of it from the U.S.S.R.

In 1973, East Germany's imports included 813,000 tons of pig iron, 474,700 tons of shapes, 638,900 tons of rods, 226,700 tons of hot-rolled strip, 60,400 tons of fine sheet, 552,300 tons of heavy sheet, 70,600 tons of cold-rolled strip, and 298,100 tons of pipes. Another factor that helped

[4] Könan, B. Elektrolyse II im CKB (Electrolytic Plant in the Chemical Combine Bitterfeld. Freiheit (Halle, East Germany), v. 30, No. 7, Jan. 8, 1975, p. 2.

to boost imports was the depletion of East Germany's iron ore resources. In 1974 no production of iron ore was reported and it may be assumed that the mines were closed down. In 1973 iron ore imports amounted to 1.8 million tons, of which 1.5 million tons came from the U.S.S.R. Much importance was given by East Germany authorities to scrap recovery. In 1974, 70% of East German steel production was based on recycled scrap.[5]

Plans for expanding East Germany's steel industry by 1975 included a new 3.5-million-ton-per-year sinter plant; conversion to natural gas at the open-hearth furnaces of the Riesa, Gröditz, and Brandenburg steelworks; reconstruction and expansion of the rolling mills as Riesa, Hennigsdorf Maxhütte; conversion of the Maxhütte Bessemer plant to a basic oxygen operation; completion of a 1-million-ton-per-year cold-sheet rolling mill; startup of a new 10,000-ton-per-year wire mill in Freital; a 20,000-ton-per-year railroad tire plant in Grödlitz; and a 650,000- to 700,000-ton-per-year bar mill in Hennigsdorf and Brandenburg, respectively; and finally the reconstruction of a tube mill at Riesa.[6]

**Lead and Zinc.**—Estimated output of primary lead and zinc was 4,000 and 5,000 tons, respectively. Depletion of deposits made East Germany increasingly dependent on secondary and imported metal. Secondary lead and zinc output was unchanged at 20,000 and 18,000 tons, respectively, in 1974; estimated consumption of lead and zinc was 100,000 and 80,000 tons, respectively.

**Nickel.**—After modernization of East Germany's nickel industry in 1974, production was 1,300 tons, an increase of 8.3% over that of 1973. All production has been centralized to the Aue (St. Egidien) nickel plant. The smelter slag byproduct is used for mineral wool.

**Silver.**—In 1974 estimated silver output further decreased 25% from that in 1973, to reach 3 million ounces. This was caused by the dwindling of domestic nonferrous metals resources which contain gold and silver that are recovered as byproducts. The metals are produced at the Wilhelm Pieck nonferrous combine in Mansfield and Eisleben, and at the Halsbrücke plant of the Freiberg metallurgical combine.

**Tin.**—East Germany's estimated mine and refined tin output in 1974 was 1,000 and 1,200 long tons, respectively, unchanged as compared with production. Improvement in the process and plant allowed maintenance of present production levels while using lower grade domestic ores. Ore from the Harz Mountains is subjected to flotation and pyrometallurgical concentration at the Albert Funk combine in Freiberg.

## NONMETALS

Production of nonmetallic mineral commodities did not change much during the year except for a few commodities which showed moderate increases. Among these were cement and nitrogenous and postassic fertilizers. The resource position varied from adequacy for some nonmetals, to apparent shortages of others such as asbestos, phosphatic raw materials, graphite, mica, pyrites, and sulfuric acid.

**Barite.**—Domestic barite output was adequate, leaving about one-third of production for export. Estimated barite output in 1974 was unchanged at 31,000 tons. East Germany's barite is processed at the Lengenfeld fluorite and barite plant which is located in the south of the country.

**Bromine.**—A new 910-ton-per-year bromine plant went onstream during 1974. Bromine is a byproduct of the refining of potash.

**Cement.**—Cement output was 10.1 million tons, an increase of 5.8% compared with that in 1973. Several cement plant construction projects were in progress during the year. Construction of the second production line at the Deuna Cement Works will be completed in 1975. After the commissioning of all four production lines, total capacity will reach 2.5 million tons per year.[7] The capacity of the Karsdorf Cement Works will be also increased. At present it produces 4.3 million tons, or 40% of East Germany's total output. With East German assistance, construction continued on a 1,000-ton-per-day cement plant at Hama, Syria, 210 kilometers north of Damascus.

**Chalk.**—In 1974 estimated chalk production was 48,000 tons, an increase of 6.7% over that of 1973. East Germany has Europe's largest chalk deposits which are lo-

[5] Neues Deutschland (East Berlin). Dec. 12, 1974, p. 3.
[6] Graf G. Entwicklung der Metallurgie der DDR (Development of the German Democratic Republic's Metallurgy). Neue Hütte (Leipzig), v. 18, No. 11, November 1973, p. 643.
[7] Neues Deutschland (East Berlin). Dec. 7, 1974, p. 3.

cated on Rügen Island near Sassnitz. The opencast Wittenfeld mine, and the Klementevitz processing plant are operated by the Rügen chalkworks belonging to the Dessau cement combine. Plans are to raise production progressively 160% by 1980. About 25% of current output is exported.

**Clays.**—At the Grimmen light-aggregate plant for ceramic purposes, 1,620 cubic meters of clay were produced daily.

**Fertilizer Materials.**—Estimated fertilizer production contained 3.7 million tons of nutrients,[8] an increase of 10.8% over that of 1973. Nitrogen fertilizers constituted 12.3%, phosphorus fertilizers 11.0%, and potassium fertilizers, 76.7% of total production.

There was no significant change in the exports of fertilizer materials. Potash exports were 1.8 million tons in 1973, virtually unchanged compared with those in 1972. There were no significant exports of nitrogenous or phosphatic materials.

*Nitrogen.*—Nitrogen production was 460,000 tons, 49,000 tons more than in 1973. Of this an estimated 38.7% was ammonium sulfate, 43.5% was calcium ammonium sulfate, and the rest urea with other complex nitrogen fertilizers. In 1973 total imports of nitrogen fertilizers were 237,100 tons of active substance. Most of East German fertilizer nitrogen production is centered around Leipzig in the south of the country, with one important plant located at Schwedt on the Polish border. Older nitrogen plants were located near Leuna because of the lignite deposits in that area. In 1973 the country's nitrogen fertilizer production, by type, with quantities produced in thousand tons, and producing plants, in parentheses were as follows: Ammonia (619; Leuna, Schwedt); ammonium nitrate (259; Schwedt, Wolfen, Bitterfeld, Piesteritz); ammonium sulfate (150; Leuna); potassium nitrate (11; Sonderhausen, Wolfen); urea (45; Leuna); calcium cyanamide (17; Piesteritz, Zschopau); and complex fertilizer (225; Piesteritz).

Two urea plants with a combined capacity of 738,000 tons are scheduled to enter production at Piesteritz in 1975. Urea capacity is also to be expanded with the construction of three other plants having a total capacity of 480,000 tons of nitrogen. Western technology will be used, but the plants will be built with COMECON and Czechoslovak assistance. All three units will be commissioned in 1975 or thereafter.

East Germany also assisted the U.S.S.R. in the construction of an ammonia plant at Kingisepp. In return for technical aid, East Germany will receive part of the plant's production.

*Phosphate.*—East Germany has virtually no indigenous phosphatic raw materials and imports most of its needs. In 1973 the U.S.S.R. supplied 431,000 tons; Morocco, 111,000 tons; and Tunisia, 54,000 tons. The country also imported 46,500 tons of phosphatic fertilizer products.

Total production of phosphatic fertilizer was an estimated 410,000 tons of active substance ($P_2O_5$) in 1974, an increase of 1.7% over that of 1973. Of the phosphatic fertilizer produced, 51% was superphosphate; 28.8% calcined phosphate; 3.4% Thomas slag; and 16.8% was of unspecified type. Estimated capacity for producing phosphoric acid in 1974 was 40,000 tons per year.

*Potassium.*—In 1974 East Germany overtook West Germany in the production of potash and became the world's third largest producer of this commodity, following the U.S.S.R. and Canada in that order. Potash output reached 2.9 million tons, an increase of 12.1% over that of 1973.

Increased potassium fertilizer output was obtained entirely through the commissioning of new facilities at the Zielitz potassium combine, replacing the old Strassfurt mine which had been shut down. The country's potash reserves are estimated at 13 billion tons.[9] The production plan target for 1975 was 3.2 million tons of $K_2O$ equivalent. East Germany was a major exporter of potassic fertilizer with exports equivalent to 1.8 million tons of $K_2O$ in 1973, virtually unchanged compared with that in 1972. Some of the more important recipients of East German potassic fertilizer exports in 1973, in tons of $K_2O$ equivalent, were Czechoslovakia (446,300); United Kingdom (150,963); Hungary (126,200); Austria (66,522); and Brazil (43,558). There were 647 accidents with the loss of one or more workdays, corresponding to 0.11 accident per 10,000 hours worked in the potash industry in 1973. Total work force of the potash industry was estimated at 33,900 in 1974.

**Gypsum.**—Estimated marketable calcined production, 289,320 tons, was unchanged

[8] The active ingredients (nitrogen, phosphates, and potash) are expressed as N, $P_2O_5$ and $K_2O$, respectively.

[9] Industria Mineraria (Milano). V. 24, No. 3, March 1973, p. 153.

in 1974 compared with that in 1973. The country's demand was 400,000 tons because of increased use in cement and plasterboard. Gypsum production is expected to double by 1980.[10]

**Sulfuric Acid.**—Production decreased by 53,000 tons in 1974, to 1,005,000 tons, compared with that in 1973. A new 200,000-ton-per-year brimstone based sulfuric acid plant was commissioned near Gera in 1974.

## MINERAL FUELS

East Germany's primary energy production from fossil fuels, hydroelectric power, and nuclear energy rose from 84.5 million tons of standard fuel equivalent in 1973 to an estimated 86.2 million tons in 1974. The estimated output of crude oil was unchanged at 346,000 tons and that of natural gas increased from 7.0 billion to 8.3 billion cubic meters. The share of these two fuels in East Germany's primary energy supply increased from 25.7% to about 27.9% during the 1973–74 period. In 1974, East Germany produced an estimated 246.8 million tons of coal and lignite. The share of coal (bituminous coal and lignite) in the primary energy supply declined from 73.9% in 1973 to 71.8% in 1974. While the production of natural gas increased significantly, the output of crude oil was unchanged and that of coal declined slightly. The share of coal in the energy balance will decline while production is unchanged, but it will remain the major source of energy consumed in East Germany well into the 21st century. The share of liquid and gaseous hydrocarbons will gain steadily in importance.

In 1974 the country produced 80.3 terawatt hours of electricity, 4.4% more than in 1973. Thermal powerplants generated 71.2 terawatt-hours (88.7%) of electricity, hydroelectric powerplants about 1.3 terawatt-hours (1.6%), and nuclear powerplants, including all other types of energy sources 7.8 terawatt-hours (9.7%). Installed capacity of power-generating plants in the country at yearend totaled 15,800 megawatts. In 1974 East German industry consumed about 58,000 million kilowatt-hours, 74.4% of the electrical energy produced, and about 2.1 billion cubic meters of manufactured gas, or 43% of the gas manufactured in the country. The plan target for electric energy production for 1975 was 88 billion to 90 billion kilowatt-hours.

There is no plan for increasing the country's lignite production during the next 10 years, but efforts were made to raise production of crude oil and that of natural gas. Primary fuel exports consisted mainly of some fuel briquets and petroleum products. In 1974 as in previous years, the U.S.S.R. was the country's major supplier of crude oil and more recently of natural gas, with deliveries of about 14 million tons and 2.8 billion cubic meters, respectively.

Total primary energy balances for East Germany in 1973 and 1974 are shown in table 4.

[10] Meissner, M. (Importance of the gypsum industry for East Germany's building industry.) Baustoffindustrie (Leipzig), February 1975, No. 1, p. 4.

**Table 4.—East Germany: Primary energy balance for 1973 and 1974[1]**
(Million tons standard fuel equivalent)

| Year | Total primary energy | Coal (lignite, brown, bituminous) and coke | Crude oil and petroleum products | Natural and associated gas | Hydroelectric and nuclear electricity |
|---|---|---|---|---|---|
| 1973: | | | | | |
| Production | 84.493 | 74.600 | 0.450 | 9.242 | 0.201 |
| Imports | 33.339 | 11.220 | 20.859 | 1.052 | .208 |
| Exports | 3.812 | 1.511 | 2.237 | .013 | .051 |
| Apparent consumption | 114.020 | 84.309 | 19.072 | 10.281 | .358 |
| 1974: | | | | | |
| Production | 86.157 | 74.450 | .450 | 11.056 | .201 |
| Imports | 36.204 | 11.220 | 22.100 | 2.664 | .220 |
| Exports | 5.082 | 1.500 | 3.500 | .012 | .070 |
| Apparent consumption | 117.279 | 84.170 | 19.050 | 13.708 | .351 |

[1] Production data for 1973 and 1974 were taken from the Statistical Yearbook of the D.D.R. (East Berlin); Satistische Praxis (Berlin) and other sources.

**Coal and Lignite.**—Lignite output was about 246.2 million tons, unchanged in 1974 compared with that of 1973. As in previous years, East Germany was the world's leading producer followed by the U.S.S.R. West Germany, and Czechoslovakia, in that order. The country's lignite reserves were estimated at 20 billion tons.[11]

Efforts in the lignite mining industry were directed at concentrating mining into larger and more efficient units. Negotiations were underway between East and West Germany for the mining of an estimated 15 million tons of lignite located in the Helmstedt-Harbke area on the common border of the two countries.

**Natural Gas.**—Natural gas production reached an estimated 8.3 billion cubic meters, an increase of 1.3 billion cubic meters compared with 1973 production. The country also produced 4.9 billion cubic meters of manufactured gas, about 100 million more than in 1973. Imports of Soviet natural gas were less than 3 billion cubic meters in 1974.

Development work at the Salzwedel gasfields continued, with further substantial growth of natural gas production to be expected. East Germany's gasfields are located on its common border with West Germany. Recently West Germany has shown interest in developing these resources on its side of the common border.

In 1974, the country had 17 gas and coking plants feeding into the national gas network. Manufactured gas is distributed by a 4,000-kilometer-pipeline network having total capacity of 7 billion cubic meters per year. The network includes the underground gas storage facilities at Ketzin. Natural gas was distributed by a 700-kilometer, pipeline system with an 8-billion-cubic-meter-per-year capacity and consisting of a 750 and a 900-millimeter-in-diameter pipeline. An underground storage facility at Bernburg is part of this system. Imported natural gas is served by a 400-kilometer long and 900-millimeter-in-diameter pipeline.

**Petroleum.**—Estimated crude oil production was 2.5 million barrels in 1974, unchanged compared with that in 1973. Domestic production provided only 2.2% of the country's crude oil requirements, while the rest had to be imported.

The Friendship pipeline which extends from the U.S.S.R. to East Germany carries Soviet oil to East Germany's Schwedt petrochemical combine which is 27 kilometers from the Polish border. In 1974 East Germany's crude oil pipeline network exceeded 1,000 kilometers in length. This pipeline system connects Schwedt and the terminal of the Friendship pipeline with the North Sea port of Rostock where most of the overseas oil shipments arrive; it also connects Berlin and the major petrochemical centers of the country such as Leuna, Böhlen, and Zeitz. There is also a 130-kilometer pipeline to Zaluzi, Czechoslovakia.

East Germany has refining plants at Schwedt, Leuna, Böhlen, and Lützgendorf. The country's total refining capacity of 12 million tons per year in 1973, is to be increased to 20 million tons by 1975, requiring an increase of 67%.

Intensive development continued also in the petrochemical industry. The Schwedt petrochemical combine, which includes the Schwedt oil refinery in 1974 had a throughput of about 8 million tons per year which is to be raised by 1975 to 8.4 million tons. The Otto Grotewohl petrochemical plant in Böhlen which is also part of the Schwedt petrochemical combine performs low temperature lignite distillation for recovering low temperature tar, a petrochemical feedstock. At yearend 1974 an olefin complex located in Böhlen was subjected to test runs. The complex will produce a total of 300,000 tons of ethylene, propylene, and butadiene which will replace the low-temperature tar used. About 60% of the olefin production is sent to Czechoslovakia by pipeline. The Zeitz hydration plant which is also part of the Schwedt petrochemical combine produced lubricating oils, fats, and bitumen. The Leuna petrochemical combine supplied 10% of the country's chemical products which included mainly light distillate fuel oils, plastics, and synthetic fibers. East Germany also contributed help for construction of the Novoplozk high-density polyethylene plant in the U.S.S.R.

**Nuclear Power.**—In 1974 East Germany had two operating nuclear powerplants. The first is the Rheinsberg 70-megawatt nuclear powerplant commissioned in 1966. The other is the Bruno Leuschner Nord-Greifswald nuclear powerplant that had been under construction since 1967 and has two operating 440-megawatt units commissioned during the year—one unit under full power and the second unit under test runs. East Germany's third nuclear powerplant to be erected at Magdeburg was in the planning stage. All nuclear powerplants were built with the help of the U.S.S.R.

[11] Glückauf (Essen). V. 108, No. 23, November 1972, p. 1090. Neue Bergbautechnik (Leipzig). V. 2, No. 11, November 1972, p. 837.

# The Mineral Industry of the Federal Republic of Germany

By D. H. Desy [1]

The general economy entered into a decline in 1974, particularly during the second half of the year. The gross national product (GNP) in terms of 1962 prices showed an increase of 0.4% for 1974 but had declined in the second half of the year. Inflation was held to 7%, low in comparison with other industrialized nations, while unemployment rose to 2.6% from 1.3% in 1973.

In December, the Government and the Bundesbank took steps to stimulate the economy, including an investment bonus plan, additional Federal expenditures of $700 million and a general relaxation of the tight money policy.

The GNP in 1974 was $413.1 billion compared with $343.4 billion in 1973, at current prices. This was equivalent to a per capita GNP of $6,658 in 1974 and $5,529 in 1973. Total exports amounted to $95.6 billion in 1974 as compared with $66.1 billion in 1973, and exports to the United States were $7.2 billion in 1974 and $5.6 billion in 1973.

Total imports in 1974 and 1973 were $74.6 billion and $53.9 billion, respectively, while imports from the United States were $5.8 billion in 1974 and $4.5 billion in 1973.

Employment and turnover figures for the mineral industry are shown in table 1. Average employment in the mineral industry was 812,000 in 1974, 2.8% below the 836,000 of 1973. Total turnover was 42% above that in 1973.

[1] Physical scientist, Division of Ferrous Metals.

## PRODUCTION AND TRADE

The index of industrial production (1970=100) for 1974 was 111.4, down 2% from 113.1 in 1973. In the mineral industry, iron and steel production showed the greatest gain, while mining, petroleum, and stone and sand all registered declines.

| Industry sector | Index of production (1970=100) | | Change (percent) |
|---|---|---|---|
| | 1973 | 1974 [p] | |
| Mining | 91.8 | 90.7 | −1 |
| Coal | 86.0 | 84.5 | −2 |
| Metal ores: | | | |
| Iron | 94.5 | 82.3 | −13 |
| Nonferrous | 97.0 | 90.9 | −6 |
| Potash and salt | 99.4 | 102.8 | +3 |
| Crude oil and natural gas | 132.8 | 135.5 | +2 |
| Iron and steel | 111.8 | 120.7 | +8 |
| Nonferrous metals | 117.4 | 118.5 | +1 |
| Petroleum, refined | 110.5 | 101.8 | −8 |
| Stone and sand | 110.9 | 100.2 | −10 |

[p] Preliminary.

Source: Statistisches Bundesamt, Wiesbaden. Industrie und Handwerk, Reihe 2, January 1975.

## Table 1.—Federal Republic of Germany: Employment and turnover in the mineral industry

| | Average 1974 employment (thousand persons) | Turnover (million dollars) | | | |
|---|---|---|---|---|---|
| | | 1973 [1] | | 1974 [2] | |
| | | Domestic | Foreign | Domestic | Foreign |
| **MINES** | | | | | |
| Iron | 3 | 57 | (3) | 72 | (3) |
| Nonferrous metals | 3 | 39 | 10 | 52 | 18 |
| Potash and salt | 12 | 268 | 104 | 329 | 136 |
| Other nonmetallic minerals | 1 | 15 | 6 | 17 | 8 |
| Coal | 204 | 2,453 | 898 | 3,762 | 1,611 |
| Lignite | 20 | 389 | 15 | 469 | 22 |
| Peat | 3 | 48 | 12 | 64 | 13 |
| Oil and gas | 6 | 639 | 4 | 1,115 | 3 |
| Total | 252 | 3,908 | 1,049 | 5,880 | 1,811 |
| **QUARRIES** | | | | | |
| Stone | 22 | 632 | 9 | 792 | 11 |
| Sand and gravel | 13 | 467 | 26 | 482 | 29 |
| Slate, clays, other | 28 | 1,102 | 59 | 1,234 | 86 |
| Cement | 16 | 895 | 35 | 1,000 | 53 |
| Refractories | 16 | 292 | 101 | 384 | 171 |
| Lime, gypsum, chalk | 14 | 480 | 38 | 547 | 49 |
| Limestone, sandstone | 5 | 225 | 1 | 201 | (3) |
| Pumice | 5 | 238 | 2 | 190 | 2 |
| Total | 119 | 4,331 | 271 | 4,830 | 401 |
| **PROCESSING PLANTS** | | | | | |
| Iron and steel | 316 | 9,361 | 3,781 | 12,659 | 6,875 |
| Nonferrous plants | 90 | 3,539 | 855 | 4,561 | 1,356 |
| Petroleum refineries | 32 | 9,456 | 355 | 13,287 | 790 |
| Coal chemicals | 3 | 101 | 35 | 162 | 67 |
| Total | 441 | 22,457 | 5,026 | 30,669 | 9,088 |
| Grand total | 812 | 30,696 | 6,346 | 41,379 | 11,300 |

[1] Values have been converted from Deutsche marks to U.S. dollars at the rate of DM2.70=US$1.00.
[2] Values have been converted from Deutsche marks to U.S. dollars at the rate of DM2.41=US$1.00.
[3] Less than ½ unit.

Source: Statistisches Bundesamt, Wiesbaden. Industrie und Handwerk, Reihe 1, December 1974.

## Table 2.—Federal Republic of Germany: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| **METALS** | | | | |
| Aluminum: | | | | |
| Bauxite, gross weight | | [r] 1,957 | 1,642 | [e] 2,000 |
| Alumina | thousand tons | 916 | 905 | 1,307 |
| Metal: | | | | |
| Primary | do | 445 | 533 | 689 |
| Secondary: | do | 32 | 36 | 47 |
| Unalloyed | do | 262 | 295 | 280 |
| Alloyed | do | 300 | 400 | 450 |
| Bismuth, smelter | | 914 | 1,221 | 1,339 |
| Cadmium, smelter | | 457 | 370 | 356 |
| Cobalt, smelter | | | | |
| Copper: | | | | |
| Mine output, metal content | | 1,321 | 1,436 | 1,734 |
| Metal: | | | | |
| Blister and anodes: | | | | |
| Primary | | 159,427 | 239,608 | 203,997 |
| Secondary | | 101,519 | 74,464 | 54,614 |
| Refined, including secondary: | | | | |
| Electrolytic | | 300,584 | 300,662 | 313,152 |
| Fire refined | | 97,940 | 105,996 | 110,409 |
| Gold: | | | | |
| Mine output, metal content | troy ounces | 2,710 | 2,087 | 1,313 |
| Metal (including secondary) | do | 199,752 | 298,937 | 313,437 |
| Iron and steel: | | | | |
| Iron ore and concentrate | thousand tons | [r] 4,825 | 5,069 | 4,439 |
| Pig iron and blast furnace ferroalloys | do | [r] 32,002 | 36,828 | 40,221 |
| Electric furnace ferroalloys | do | [r] 218 | 265 | 283 |
| Steel ingots and castings | do | 43,705 | 49,521 | 53,232 |
| Semimanufactures | do | 31,192 | 36,706 | 39,615 |

See footnotes at end of table.

## Table 2.—Federal Republic of Germany: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| METALS—Continued | | | | |
| Lead: | | | | |
| Mine output, metal content | | 38,630 | 34,890 | 30,514 |
| Metal, unalloyed: | | | | |
| Primary | | r 102,200 | 85,800 | 116,400 |
| Secondary | | r 171,200 | 216,800 | 205,200 |
| Magnesium metal and alloys: | | | | |
| Unwrought (secondary only) e | | 1,800 | 1,800 | 1,700 |
| Castings | | 33,721 | 34,102 | 23,697 |
| Mercury (secondary only) | 76-pound flasks | 2,031 | e 5,800 | e 7,300 |
| Molybdenum metal | | e 150 | 263 | 186 |
| Nickel including secondary [1] | | 200 | 125 | 146 |
| Platinum | troy ounces | 2,283 | 4,340 | 4,115 |
| Silver: | | | | |
| Mine output, metal content | thousand troy ounces | 1,756 | 1,446 | 1,228 |
| Metal including secondary | do | 20,120 | 20,821 | 23,586 |
| Tin metal, including secondary | long tons | r 2,337 | 2,108 | 2,488 |
| Tungsten metal | | e 800 | 1,609 | 1,513 |
| Zinc: | | | | |
| Mine output, metal content | | r 121,733 | 122,843 | 116,044 |
| Metal, unwrought, unalloyed, primary | | r 124,670 | 142,016 | 134,383 |
| NONMETALS | | | | |
| Barite | | 373,140 | 330,034 | 298,104 |
| Bromine, fluorine and iodine | | 4,347 | 4,638 | 5,304 |
| Cement, hydraulic | thousand tons | 43,145 | 41,012 | 35,977 |
| Chalk | do | 206 | 256 | 259 |
| Clays: | | | | |
| Fire clay (exclusive of klebsand) | do | 4,862 | 5,319 | e 5,500 |
| Kaolin (marketable) | do | r 488 | 488 | e 501 |
| Bleaching | do | 589 | 636 | e 675 |
| Other (schieferton) | do | 133 | 125 | e 125 |
| Corundum, artificial | do | 93 | 98 | 101 |
| Diatomite and similar earths (marketable) | | r 69,622 | 47,516 | 42,881 |
| Feldspar (marketable) | | 349,446 | 355,791 | e 360,000 |
| Fertilizers: | | | | |
| Crude: | | | | |
| Phosphate rock | thousand tons | 71 | 93 | 85 |
| Potassic: | | | | |
| Gross weight | do | r 23,023 | 24,950 | 26,202 |
| $K_2O$ equivalent | do | 2,845 | 2,975 | 3,090 |
| Manufactured: | | | | |
| Nitrogenous (nitrogen content): | | | | |
| Nitrogen fertilizers | do | 959 | 1,006 | 1,104 |
| Mixed fertilizers | do | 420 | 453 | 460 |
| Total | do | 1,379 | 1,459 | 1,564 |
| Phosphatic ($P_2O_5$ content): | | | | |
| Superphosphate | do | 57 | 48 | 60 |
| Thomas slag fertilizers | do | 300 | 264 | 242 |
| Other phosphatic fertilizers | do | r 190 | 227 | NA |
| Mixed fertilizers | do | 418 | 447 | 448 |
| Total | do | r 965 | 986 | NA |
| Potassic, $K_2O$ equivalent: | | | | |
| Marketable crude | do | 53 | 56 | 58 |
| Chemically processed | do | 2,395 | 2,492 | 2,562 |
| Total | do | 2,448 | 2,548 | 2,620 |
| Content of mixed fertilizers [2] | do | 426 | 446 | 488 |
| Mixed fertilizers, gross weight | do | 2,938 | 3,099 | 3,214 |
| Fluorspar (marketable): | | | | |
| Acid grade | | 83,051 | e 82,191 | e 72,762 |
| Metallurgical grade | | 9,994 | e 9,890 | e 8,756 |
| Total | | r 93,045 | 92,081 | 81,518 |
| Graphite: | | | | |
| Crude | | 12,374 | 18,561 | e 20,000 |
| Marketable [3] | | 11,348 | 13,525 | e 15,000 |
| Gypsum and anhydrite, marketable | thousand tons | 2,683 | 2,948 | e 3,200 |
| Lime, quicklime and hydrated lime, including dead-burned dolomite | do | 10,913 | 11,236 | 11,211 |
| Pigments, natural mineral | do | 18 | 20 | NA |
| Pumice: | | | | |
| Crude and washed | do | 8,263 | 7,035 | 4,822 |
| Marketable | do | 5,020 | 3,794 | 2,101 |

See footnotes at end of table.

## Table 2.—Federal Republic of Germany: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Pyrite (marketable concentrate): | | | | |
| Gross weight | thousand tons | 422 | 428 | [e] 430 |
| Sulfur content | do | 190 | 192 | [e] 192 |
| Quartz, quartzite, glass sand: | | | | |
| Quartzite | do | 267 | 258 | [4] 353 |
| Quartz sand (ground) | do | 716 | 539 | 473 |
| Quartz sand (unground) and glass sand | do | 5,554 | 7,076 | 7,301 |
| Salt (marketable): | | | | |
| Rock | do | [r] 6,028 | 6,564 | 7,184 |
| Marine and other | do | [r] 2,434 | 3,637 | [e] 3,800 |
| Stone, sand and gravel, n.e.s.: | | | | |
| Dimension stone | thousand cubic meters | 286 | 295 | 242 |
| Limestone, industrial | thousand tons | 67,766 | 75,384 | 59,144 |
| Crushed and broken | do | 124,555 | 119,411 | 124,667 |
| Slate: [5] | | | | |
| Roofing for office and industry | do | 13 | 12 | 11 |
| Splittings and ground | do | 48 | NA | NA |
| Basalt lava and lava sand | do | 7,931 | 7,477 | NA |
| Calcite | do | 12 | 20 | NA |
| Grinding stone | cubic meters | 56 | 65 | 59 |
| Tuff | thousand tons | 2 | 1 | NA |
| Industrial sands: | | | | |
| Molding sand | do | 1,050 | 1,169 | 1,155 |
| Other (klebsand) | do | 150 | 172 | 197 |
| Sand and gravel | do | 219,999 | 206,860 | 183,946 |
| Sulfur, elemental byproduct | do | 219 | 333 | 416 |
| Talc, including talc schist | do | 30 | 28 | 29 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Carbon black | | 264,106 | 290,546 | 299,668 |
| Coal: | | | | |
| Anthracite | thousand tons | [r] 7,977 | 6,763 | 6,910 |
| Bituminous | do | [r] 94,493 | 90,576 | 87,966 |
| Lignite | do | [r] 110,415 | 118,658 | 126,043 |
| Total | do | [r] 212,885 | 215,997 | 220,919 |
| Coke: | | | | |
| Metallurgical | do | [r] 34,451 | 33,997 | 34,940 |
| Gas house | do | [r] 1,719 | 1,547 | 1,544 |
| Total | do | [r] 36,170 | 35,544 | 36,484 |
| Fuel briquets: | | | | |
| Anthracite and bituminous | do | 2,427 | 2,271 | 2,249 |
| Lignite | do | 6,751 | 6,487 | 6,326 |
| Gas: | | | | |
| Manufactured gas (excluding that from petroleum refineries): | | | | |
| Blast furnace gas | million cubic feet | 458,418 | 517,251 | 544,761 |
| Coke oven gas [6] | do | 555,144 | 544,973 | 562,454 |
| Other gas | do | 201,646 | 179,927 | 155,631 |
| Total | do | 1,215,208 | 1,242,151 | 1,262,846 |
| Natural: | | | | |
| Gross production | do | [r] 646,241 | 706,131 | [e] 734,787 |
| Marketable production | do | [r] 636,679 | 695,537 | 719,514 |
| Peat: | | | | |
| Agricultural use | thousand tons | 1,678 | 1,757 | 1,871 |
| Fuel | do | 284 | 279 | 187 |
| Petroleum: | | | | |
| Crude | thousand 42-gallon barrels | 51,271 | 47,944 | 44,718 |
| Refinery products: | | | | |
| Gasoline, aviation and motor | do | 115,927 | 121,803 | 163,944 |
| Jet fuel | do | 8,833 | 12,544 | 12,365 |
| Kerosine | do | 1,101 | 1,251 | 529 |
| Distillate fuel oil | do | 302,096 | 321,551 | 307,810 |
| Residual fuel oil | do | 193,087 | 231,117 | 210,135 |
| Lubricants | do | 6,638 | 6,918 | 8,787 |
| Liquefied petroleum gas | do | [r] 26,053 | 29,155 | 32,511 |
| Bitumen | do | 28,319 | 27,574 | 27,479 |
| Other | do | [r] 79,928 | 62,635 | 45,772 |
| Refinery fuel and losses | do | 49,437 | 44,547 | 40,185 |
| Total | do | [r] 811,419 | 859,095 | 849,517 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Primary nickel and nickel contained in ferronickel, Monel metal, and nickel oxide directly used by the steel industry.

[2] $K_2O$ equivalent of potassic constituent not added to $K_2O$ equivalent of marketable crude and chemically processed potassic fertilizers because this apparently would result in double counting.

[3] In part produced from imported crude graphite.

[4] Includes slate.

[5] Exclusive of slate recovered from mine dumps.

[6] Includes water gas and generator gas from coke ovens.

## Table 3.—Federal Republic of Germany: Exports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite | 5,960 | 6,360 | Belgium-Luxembourg 2,616; Romania 2,000. |
| Alumina | r 207,038 | 109,935 | NA. |
| Aluminum hydroxide | 95,844 | 105,864 | Netherlands 26,904; Sweden 24,147; Belgium-Luxembourg 10,395; France 10,350. |
| Metal including alloys: | | | |
| Scrap | 17,425 | 29,519 | Italy 10,806; Netherlands 9,704; France 6,896. |
| Unwrought | 85,190 | 104,580 | France 33,498; Belgium-Luxembourg 25,733; Italy 20,057. |
| Semimanufactures | 169,383 | 211,864 | France 61,231; Netherlands 33,657; Belgium-Luxembourg 25,034. |
| Antimony: | | | |
| Ore and concentrate | 6 | 29 | All to Austria. |
| Metal including alloys, all forms | 50 | 55 | Belgium-Luxembourg 24; France 15; Italy 5. |
| Arsenic, hydroxide and acids | 187 | 416 | India 81; Yugoslavia 41. |
| Beryllium metal including alloys, all forms kilograms | 30 | 136 | NA. |
| Bismuth metal including alloys, all forms | 259 | 316 | United States 140; Spain 52; United Kingdom 45. |
| Cadmium metal including alloys, all forms | 180 | 245 | NA. |
| Chromium: | | | |
| Chromite | 7,722 | 3,336 | France 1,163. |
| Oxide and hydroxide | 8,126 | 9,449 | NA. |
| Metal including alloys, all forms | 142 | 181 | Belgium-Luxembourg 61; United States 49; Italy 25. |
| Cobalt: | | | |
| Oxide and hydroxide | 14 | 27 | Yugoslavia 8; United Kingdom 5; Portugal 3. |
| Metal including alloys, all forms | 282 | 205 | United Kingdom 47; Netherlands 41; Japan 27. |
| Columbium and tantalum metal including alloys, all forms: | | | |
| Columbium kilograms | 4,531 | 7,609 | Belgium-Luxembourg 546. |
| Tantalum do | 37,762 | 36,970 | NA. |
| Copper: | | | |
| Ore and concentrate | -- | 951 | Mainly to Belgium-Luxembourg. |
| Matte | r 2,005 | 1,042 | All to Belgium-Luxembourg. |
| Copper sulfate | 496 | 1,250 | NA. |
| Metal including alloys: | | | |
| Scrap | 35,114 | 38,015 | Italy 13,823; Belgium-Luxembourg 7,869; Austria 5,737. |
| Unwrought: | | | |
| Blister | 20,941 | 32,785 | United Kingdom 24,490; Belgium-Luxembourg 8,238. |
| Refined | 79,452 | 110,701 | France 25,517; United Kingdom 18,616; Austria 12,397. |
| Alloys | 7,448 | 5,866 | Belgium-Luxembourg 1,784; Austria 1,026; France 935. |
| Master alloys | 484 | 1,026 | France 512; Belgium-Luxembourg 425. |
| Semimanufactures | 121,848 | 169,288 | France 28,307; United States 24,833; Netherlands 23,109. |
| Germanium metal including alloys, all forms kilograms | 3,300 | 700 | All to Romania. |
| Gold: | | | |
| Ashes, residue and scrap do | 8 | 2 | NA. |
| Metal: | | | |
| Unwrought thousand troy ounces | 253 | 274 | Italy 82; Switzerland 46; United Kingdom 30. |
| Semimanufactures do | 5,546 | 7,287 | Netherlands 2,116; France 1,743; Italy 1,405. |
| Iron and steel: | | | |
| Iron ore and concentrate | 4,802 | 6,130 | France 1,669; Switzerland 650; Italy 634. |
| Roasted pyrite | 46,817 | 192,019 | Belgium-Luxembourg 142,630; Austria 25,665; Denmark 23,082. |
| Metal: | | | |
| Scrap thousand tons | 2,122 | 2,305 | Italy 1,822. |
| Pig iron, including cast iron do | 819 | 1,165 | France 340; Italy 260; Belgium-Luxembourg 108. |

See footnotes at end of table.

## Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Metal—Continued | | | |
| Sponge iron, powder and shot thousand tons | r 26 | 25 | Switzerland 4; Netherlands 3; France 3. |
| Spiegeleisen do | 1 | 2 | Italy 1. |
| Ferroalloys: | | | |
| Ferrochrome do | 32 | 36 | France 8; Belgium-Luxembourg 7; Italy 5. |
| Ferromanganese do | 32 | 47 | Belgium-Luxembourg 25; France 12. |
| Ferronickel | 82 | 167 | Mainly to Belgium-Luxembourg. |
| Ferrosilicon thousand tons | 14 | 15 | NA. |
| Ferrosilicochrome do | 4 | 2 | Italy 1. |
| Ferrosilicomanganese | 163 | 955 | France 472; Austria 153; Belgium-Luxembourg 144. |
| Other thousand tons | 11 | 12 | Spain 2; Austria 1; Italy 1. |
| Steel, primary forms do | 2,505 | 2,654 | France 506; Italy 496; Belgium-Luxembourg 336; United States 313. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, and sections do | 3,142 | 4,081 | France 990; United States 494; Netherlands 431. |
| Universals, plates, sheets do | 4,825 | 6,150 | United States 1,018. |
| Hoop and strip do | 651 | 910 | Netherlands 131; France 127; U.S.S.R. 86. |
| Rails and accessories do | 142 | 160 | Italy 61; Netherlands 27; Brazil 18. |
| Wire do | 250 | 310 | France 69; Netherlands 43; Belgium-Luxembourg 24. |
| Tubes, pipes, fittings do | 2,383 | 3,033 | U.S.S.R. 809; Netherlands 497; People's Republic of China 279. |
| Castings and forgings, rough do | 64 | 90 | Belgium-Luxembourg 24; France 13; Switzerland 10. |
| Lead: | | | |
| Ore and concentrate | 1,548 | 654 | Mainly to Belgium-Luxembourg. |
| Oxides | 8,219 | 10,364 | Netherlands 3,797; Belgium-Luxembourg 2,432; Italy 1,239. |
| Metal including alloys: | | | |
| Scrap | 14,919 | 15,343 | Netherlands 6,761; Belgium-Luxembourg 5,227; Italy 2,772. |
| Unwrought | 66,645 | 65,870 | Italy 35,386; Netherlands 8,646; France 8,279. |
| Semimanufactures | 6,564 | 8,233 | Switzerland 1,260; Denmark 1,145; Italy 895. |
| Magnesium: | | | |
| Oxides, hydroxides and peroxides | 4,596 | 4,759 | Italy 1,010; U.S.S.R. 900; Austria 684. |
| Metal including alloys: | | | |
| Scrap | 2,861 | 2,283 | Italy 1,431; United Kingdom 324; Netherlands 274 |
| Unwrought | 268 | 488 | Italy 168; France 103; Italy 123. |
| Semimanufactures | 317 | 473 | Sweden 97; France 54; Netherlands 51. |
| Manganese: | | | |
| Ore and concentrate | 20,524 | 4,024 | Belgium-Luxembourg 3,159; Netherlands 483. |
| Oxides | 3,197 | 3,502 | NA. |
| Metal | 167 | 72 | France 25. |
| Mercury 76-pound flasks | 1,421 | 1,036 | Switzerland 293; Netherlands 151; United States 102. |
| Molybdenum: | | | |
| Ore and concentrate | 929 | 240 | France 138; United Kingdom 34; Austria 34. |
| Metal including alloys, all forms | r 228 | 292 | NA. |
| Nickel: | | | |
| Ore and concentrate | 10 | -- | |
| Matte and speiss | 126 | -- | |
| Metal including alloys: | | | |
| Scrap | 1,956 | 2,242 | United Kingdom 844; Netherlands 741; Belgium-Luxembourg 299. |
| Unwrought | 2,247 | 1,453 | Netherlands 664; France 149. |
| Semimanufactures | 11,322 | 12,791 | France 2,072; Netherlands 1,180; United States 909. |
| Platinum-group metals and silver: | | | |
| Waste and sweepings kilograms | 3,542 | 55,235 | Belgium-Luxembourg 24,000; Netherlands 22,292. |

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Platinum-group metals and silver —Continued | | | |
| Metals including alloys, all forms: | | | |
| Platinum group thousand troy ounces | 734 | 770 | Italy 250; Switzerland 141; Netherlands 62. |
| Silver do | 35,427 | 35,924 | Italy 8,622; France 3,466; Sweden 2,995. |
| Tin: | | | |
| Ore and concentrate long tons | (1) | -- | |
| Oxides do | 241 | 441 | France 46; Brazil 42; Spain 37; Italy 37. |
| Metal including alloys: | | | |
| Scrap do | 242 | 79 | Netherlands 44; Denmark 33. |
| Unwrought do | 1,206 | 1,525 | France 631; Netherlands 487. |
| Semimanufactures do | 468 | 681 | Norway 85; Belgium-Luxembourg 78; Switzerland 65. |
| Titanium: | | | |
| Ore and concentrate | 299 | 565 | France 261; Switzerland 179; Austria 80. |
| Oxides | 45,544 | 53,773 | Italy 6,903; Netherlands 5,900; France 3,995. |
| Metal including alloys, all forms | 650 | 1,128 | United Kingdom 525; United States 191; Sweden 104. |
| Tungsten: | | | |
| Ore and concentrate | 799 | 335 | France 110; United Kingdom 74; Czechoslovakia 73. |
| Metal including alloys, all forms | r 541 | 586 | NA. |
| Uranium and thorium: | | | |
| Ores and concentrates | -- | 20 | NA. |
| Uranium, thorium and rare-earth compounds | 718 | 753 | United States 487; Japan 152. |
| Metal including alloys, all forms kilograms | 3,300 | 15,900 | United Kingdom 6,100; France 4,300; Italy 2,400; Switzerland 2,400. |
| Vanadium metal including alloys, all forms do | 5,700 | 10,600 | France 9,400. |
| Zinc: | | | |
| Ore and concentrate | 43,974 | 82,187 | Belgium-Luxembourg 35,278; Netherlands 25,844; France 8,204. |
| Oxide and peroxide | 11,179 | 11,841 | NA. |
| Metal including alloys: | | | |
| Scrap | 6,787 | 9,827 | Netherlands 4,416; France 2,808; Italy 1,445. |
| Dust | 3,016 | 4,866 | Netherlands 1,703; Belgium-Luxembourg 1,174; Switzerland 839. |
| Unwrought | 104,674 | 110,274 | United Kingdom 31,580; Netherlands 20,992; Italy 18,000. |
| Semimanufactures | 10,746 | 14,440 | NA. |
| Zirconium metal including alloys, all forms | 28 | 55 | United States 31; France 11. |
| Other: | | | |
| Ore and concentrate: | | | |
| Of columbium, tantalum, vanadium, and zirconium | 1,961 | 3,057 | Italy 575; Austria 574; Belgium-Luxembourg 382. |
| Of base metals, n.e.s | 2 | 2 | All to United States. |
| Ash and residue containing nonferrous metals | 150,457 | 169,772 | Netherlands 83,797; Belgium-Luxbourg 28,874; Sweden 23,577. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | 9,373 | 10,086 | Belgium-Luxembourg 1,250; France 803. |
| Metals including alloys, all forms: | | | |
| Metalloids: | | | |
| Arsenic and tellurium | 23 | 12 | United States 2; France 1. |
| Selenium and phosphorus | 15,098 | 13,876 | NA. |
| Silicon | 159 | 2,052 | Netherlands 987; Belgium-Luxembourg 568. |
| Alkali, alkali earth, rare-earth metals | 23 | 48 | Italy 16; Japan 5. |
| Base metals, including alloys, all forms, n.e.s | r 574 | 446 | United States 110; France 51; Canada 50. |

See footnotes at end of table.

## Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS | | | |
| Abrasives: | | | |
| Natural: | | | |
| Pumice, emery, natural corundum, etc | 940,658 | 328,658 | Netherlands 227,593; Belgium-Luxembourg 96,204. |
| Dust and powder of precious and semiprecious stones thousand carats | 260 | 482 | Greece 226; Netherlands 68; Belgium-Luxembourg 65. |
| Grinding and polishing wheels and stones | 9,729 | 10,400 | France 1,543; Netherlands 1,085; Italy 793. |
| Artificial: | | | |
| Corundum | 33,752 | 37,631 | Norway 5,969; France 3,779; Netherlands 3,752. |
| Silicon carbide | 14,947 | 13,266 | NA. |
| Asbestos | 1,217 | 23,237 | Belgium-Luxembourg 10,843; Spain 5,513; Austria 2,839. |
| Barite and witherite | 103,734 | 75,879 | France 35,342; Netherlands 18,037; Romania 4,240. |
| Boron materials: | | | |
| Crude natural borates | 13,119 | 12,110 | Italy 4,230; Netherlands 2,214; Sweden 2,152. |
| Oxide and acid | 167 | 222 | Brazil 62. |
| Bromine | 270 | 333 | Poland 120; Netherlands 78; Czechoslovakia 76. |
| Cement thousand tons | 1,441 | 2,184 | Netherlands 1,200; Poland 265. |
| Chalk | 10,868 | 19,467 | Sweden 9,808; Netherlands 5,534; Switzerland 1,336. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Fire clay thousand tons | r 320 | 328 | Belgium-Luxembourg 85; Italy 78; Netherlands 56. |
| Kaolin do | 102 | 101 | Austria 33; Italy 21; Belgium-Luxembourg 16. |
| Kyanite, sillimanite, andalusite, mullite do | 1 | 1 | NA. |
| Other do | 871 | 897 | Netherlands 422; France 138; Belgium-Luxembourg 135. |
| Products: | | | |
| Refractory (including nonclay bricks) do | 671 | 731 | France 221; Belgium-Luxembourg 107; Italy 75. |
| Nonrefractory do | 535 | 652 | France 151; Netherlands 105; Belgium-Luxembourg 100. |
| Diamond: | | | |
| Gem: | | | |
| Crude or rough cut thousand carats | 20 | 10 | NA. |
| Other do | 60 | 75 | Belgium-Luxembourg 30; Netherlands 15; Switzerland 15. |
| Industrial do | 125 | 171 | Ireland 90; Netherlands 65; Switzerland 30. |
| Diatomite and other infusorial earth | r 5,354 | 5,098 | United Kingdom 1,805; Netherlands 880; Italy 714. |
| Feldspar, leucite, nepheline and nepheline syenite | 11,735 | 17,449 | Italy 3,718; Czechoslovakia 2,972; Belgium-Luxembourg 2,551. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Phosphatic | 7,069 | 7,728 | Austria 5,331. |
| Potassic | 38,938 | 41,258 | Belgium-Luxembourg 30,113. |
| Manufactured: | | | |
| Nitrogenous thousand tons | 968 | 1,294 | Belgium-Luxembourg 413; Brazil 154; France 85. |
| Phosphatic: | | | |
| Thomas slag do | 55 | 35 | Austria 17; Netherlands 10; Brazil 7. |
| Other do | 16 | 8 | Nigeria 3; Denmark 2. |
| Potassic do | 1,887 | 2,108 | Belgium-Luxembourg 447; Poland 151; Netherlands 129. |
| Mixed do | 761 | 1,078 | France 159; Turkey 147; India 101. |
| Ammonia, anhydrous do | 77 | 32 | Mainly to Belgium-Luxembourg. |
| Fluorspar | 9,991 | 17,391 | Austria 4,557; Belgium-Luxembourg 2,712; Sweden 1,599. |
| Graphite, natural | 7,076 | 9,259 | Italy 2,322; United States 2,103. |

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Gypsum and plasters | 313,452 | 304,604 | Netherlands 124,973; Switzerland 81,923; Belgium-Luxembourg 41,841. |
| Iodine | 19 | 15 | NA. |
| Lime | 587,063 | 550,453 | Netherlands 455,771. |
| Lithium minerals | 471 | 326 | Italy 254. |
| Magnesite | r 6,271 | 11,609 | France 3,462; Spain 3,025. |
| Mica: | | | |
| Crude, including splittings and waste | 711 | 832 | Switzerland 313; Sweden 129; Austria 96. |
| Worked, including agglomerated splittings | 187 | 234 | United Kingdom 58; Denmark 32. |
| Pigments, mineral: | | | |
| Natural, crude | 5,248 | 6,204 | Netherlands 2,448; Belgium-Luxembourg 841; United States 674. |
| Iron oxide and hydroxide | 125,972 | 138,028 | France 20,752; United States 17,013; United Kingdom 14,855. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural kilograms | 191,956 | 214,856 | France 33,020; Japan 31,408; Italy 21,121. |
| Manufactured do | 7,302 | 4,916 | United States 2,540; France 603. |
| Pyrite (gross weight) | 488 | 448 | United Kingdom 216; Brazil 61; Argentina 40; France 39. |
| Salt thousand tons | 1,240 | 1,631 | Belgium-Luxembourg 1,179; Sweden 197; Denmark 63. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda do | r 449 | 699 | Mainly to Netherlands. |
| Caustic potash, sodic, potassic peroxide do | 13 | 12 | U.S.S.R. 3. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous | 4,168 | 3,968 | Austria 2,163; Netherlands 610. |
| Slate | 17,478 | 19,152 | Netherlands 6,624; Belgium-Luxembourg 5,354; Denmark 3,847. |
| Other | r 241,740 | 366,820 | Netherlands 328,492; Switzerland 32,786. |
| Worked: | | | |
| Building and monumental stone | r 14,817 | 16,579 | Belgium-Luxembourg 5,084; Netherlands 4,841; France 3,052. |
| Paving and flagstone | r 33,100 | 28,656 | Netherlands 13,033; Denmark 12,293. |
| Slate | r 612 | 812 | Netherlands 346; Belgium-Luxembourg 314. |
| Dolomite | r 78,912 | 125,391 | France 70,834; Netherlands 27,166. |
| Gravel and crushed rock thousand tons | 10,609 | 11,060 | Netherlands 8,758; Switzerland 1,451. |
| Limestone do | 197 | 158 | Netherlands 140. |
| Quartz and quartzite: | | | |
| Quartz crystal kilograms | 36 | 47 | Italy 17. |
| Other | 54,543 | 51,624 | Austria 15,653; France 11,904; Belgium-Luxembourg 5,274. |
| Sand, excluding metal bearing thousand tons | 6,660 | 6,894 | Netherlands 5,917. |
| Sulfates, natural, magnesium sulfate (Kieserite) do | 360 | 450 | Netherlands 72; Norway 62; Sweden 48. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 45,019 | 66,752 | Switzerland 32,704; Denmark 10,240; Austria 9,044. |
| Colloidal | 3,507 | 4,347 | United States 1,164; Italy 564; United Kingdom 440. |
| Sulfur dioxide | 8,022 | 10,499 | Belgium-Luxembourg 3,568; Sweden 3,538; Austria 1,269. |
| Sulfuric acid | 553,223 | 563,062 | Mainly to Netherlands. |
| Talc, steatite, soapstone | r 4,709 | 5,557 | Denmark 2,621; Switzerland 436. |
| Vermiculite, chlorite, perlite | 686 | 440 | Austria 243. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Meerschaum, amber, jet kilograms | 800 | 2,800 | India 2,700. |
| Pottery | 8,550 | 32,139 | Belgium-Luxembourg 9,711; Netherlands 9,203; France 5,482. |
| Other thousand tons | r 637 | 530 | Netherlands 395; Belgium-Luxembourg 67. |

See footnotes at end of table.

## Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Other nonmetals, n.e.s.—Continued | | | |
| Slag, dross, and similar waste, not metal bearing: | | | |
| From iron and steel manufacture thousand tons | 1,087 | 1,612 | Netherlands 1,566. |
| Slag and ash, n.e.s do | 401 | 559 | Netherlands 474. |
| Oxides and hydroxides of strontium and barium | 3,611 | 4,013 | France 1,548; United States 1,157; Belgium-Luxembourg 676. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | r 99,644 | 113,594 | Mainly to Netherlands. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 994 | 1,713 | Switzerland 850; Netherlands 337; Austria 131. |
| Carbon black | 76,951 | 89,260 | France 11,504; Belgium-Luxembourg 11,018; Austria 10,677. |
| Coal and briquets: | | | |
| Anthracite and bituminous thousand tons | 13,043 | 13,856 | France 5,936; Belgium-Luxembourg 3,326; Italy 2,817. |
| Briquets of anthracite and bituminous coal do | 206 | 216 | United Kingdom 89; Austria 65; Belgium-Luxembourg 28. |
| Lignite and lignite briquets do | 639 | 601 | France 237; Austria 159; Belgium-Luxembourg 74. |
| Coke and semicoke do | r 9,055 | 10,262 | Belgium-Luxembourg 3,477; France 3,137. |
| Gas, natural do | 301 | 272 | Switzerland 115; Netherlands 56; Denmark 29. |
| Helium and other rare gases | r 15,018 | 17,437 | Mainly to France. |
| Peat and briquets thousand tons | 299 | 313 | Netherlands 162; Switzerland 50; France 40. |
| Petroleum refinery products: | | | |
| Gasoline, motor spirit thousand 42-gallon barrels | 7,155 | 9,478 | Switzerland 3,924; Austria 2,131; Poland 832. |
| Kerosine, white spirit do | 8,556 | 9,657 | Ship stores 8,114. |
| Distillate fuel oil do | 15,077 | 16,516 | Switzerland 7,729; Poland 2,609; ship stores 2,240. |
| Residual fuel oil do | 24,802 | 26,180 | Ship stores 11,049; Austria 4,321; Belgium-Luxembourg 2,621. |
| Lubricants do | 2,696 | 2,592 | Belgium-Luxembourg 502; Sweden 404; United Kingdom 298. |
| Mineral jelly and wax do | 904 | 1,077 | Italy 112; Netherlands 95; Denmark 94. |
| Other do | 16,786 | 17,325 | Netherlands 4,913; France 4,881; Austria 1,490. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons | 224 | 221 | Netherlands 98; France 54; Switzerland 13. |

r Revised. NA Not available.
1 Less than ½ unit.

## Table 4.—Federal Republic of Germany: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite thousand tons | 2,330 | 2,749 | Australia 1,613; Yugoslavia 348; Sierra Leone 303. |
| Alumina | 310,612 | 374,161 | Italy 48,406; France 20,127; Guinea 18,709. |
| Aluminum hydroxide | 1,475 | 2,596 | United States 1,654; United Kingdom 349; France 272. |
| Metal including alloys: | | | |
| Scrap | 85,956 | 86,440 | Austria 22,842; Netherlands 14,038; United States 11,459. |
| Unwrought | 224,826 | 392,986 | Norway 147,628; Netherlands 48,040; France 40,540. |
| Semimanufactures | 143,793 | 162,272 | Belgium-Luxembourg 48,426; France 44,322; Netherlands 38,354. |

See footnotes at end of table.

**Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Antimony: | | | |
| Ore and concentrate | 3,326 | 3,012 | Turkey 1,200; Bolivia 1,051; Thailand 392. |
| Metal including alloys, all forms | 1,363 | 1,377 | Belgium-Luxembourg 743; People's Republic of China 346. |
| Arsenic hydroxide | 762 | 751 | France 585; Belgium-Luxembourg 105. |
| Beryllium metal including alloys, all forms ---- kilograms | 304 | 2,966 | France 2,412; United States 479. |
| Bismuth metal including alloys, all forms | r 283 | 215 | Japan 71; United Kingdom 61. |
| Cadmium metal including alloys, all forms | 1,260 | 1,249 | Belgium-Luxembourg 446; Japan 318; U.S.S.R. 202. |
| Chromium: | | | |
| Chromite | 372,045 | 508,692 | Republic of South Africa 177,030; U.S.S.R. 168,076; Mozambique 80,422. |
| Oxide and hydroxide | 2,954 | 2,556 | Netherlands 431; Yugoslavia 276; Italy 262. |
| Metal including alloys, all forms | 215 | 292 | France 118; U.S.S.R. 83; Japan 34. |
| Cobalt metal including alloys, all forms | 1,252 | 1,681 | United States 501; Zaire 416; Belgium-Luxembourg 381. |
| Columbium and tantalum metal including alloys, all forms: | | | |
| Columbium ---- kilograms | 5,038 | 4,504 | United States 4,264. |
| Tantalum ---- do | 55,488 | 98,145 | United States 80,045. |
| Copper: | | | |
| Ore and concentrate | 417,117 | 514,806 | New Guinea 244,245; Republic of South Africa 58,531; Indonesia 37,861. |
| Matte | 269 | 893 | United States 876. |
| Copper sulfate | 5,570 | 9,859 | France 3,729; Bulgaria 3,382; U.S.S.R. 1,582. |
| Metal including alloys: | | | |
| Scrap | 71,644 | 116,655 | France 23,524; Netherlands 21,834; United States 14,884. |
| Unwrought: | | | |
| Blister | 117,894 | 121,169 | Republic of South Africa 53,131; Chile 26,067; Peru 14,218. |
| Refined | 393,678 | 401,792 | Chile 76,688; Belgium-Luxembourg 66,319; Zambia 53,639. |
| Alloys | 55,561 | 50,942 | United Kingdom 13,797; U.S.S.R. 6,941; Belgium-Luxembourg 4,001. |
| Master alloys | 1,578 | 1,688 | United Kingdom 1,201; Switzerland 192. |
| Semimanufactures | 100,491 | 117,506 | Belgium-Luxembourg 44,998; France 35,661; Netherlands 11,506. |
| Gold: | | | |
| Ashes, residue and scrap kilograms | 226,777 | 146,223 | Switzerland 48,461; United States 47,469; Netherlands 18,401. |
| Metal: | | | |
| Unwrought thousand troy ounces | 2,750 | 2,653 | Switzerland 1,196; Republic of South Africa 735; U.S.S.R. 480. |
| Semimanufactures ---- do | 91 | 123 | Switzerland 82; United States 25. |
| Iron and steel: | | | |
| Iron ore and concentrate thousand tons | 40,670 | 50,325 | India 12,140; Brazil 11,043; Liberia 8,543. |
| Roasted pyrite ---- do | 1,195 | 752 | Spain 437; Belgium-Luxembourg 176; Denmark 85. |
| Metal: | | | |
| Scrap ---- do | 1,208 | 1,480 | Netherlands 874; Belgium-Luxembourg 221; France 147. |
| Pig iron, including cast iron do | 188 | 228 | Canada 65; U.S.S.R. 43; France 40; Netherlands 27. |
| Sponge iron, powder and shot do | 40 | 37 | Sweden 13; France 11. |
| Spiegeleisen | 410 | 1,498 | Belgium-Luxembourg 851; France 647. |

See footnotes at end of table.

## Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Metal—Continued | | | |
| Ferroalloys: | | | |
| Ferrochrome thousand tons | 64 | 79 | Republic of South Africa 39. |
| Ferromanganese do | 161 | 182 | France 78; Norway 30; Belgium-Luxembourg 25. |
| Ferronickel do | 30 | 55 | New Caledonia 27; Greece 15; Dominican Republic 6. |
| Ferrosilicon do | 129 | 145 | Norway 69; France 35; Portugal 8; Yugoslavia 8. |
| Ferrosilicochrome do | 17 | 20 | Republic of South Africa 12; Sweden 3; France 3. |
| Ferrosilicomanganese do | 59 | 75 | Norway 47; Czechoslovakia 9; Republic of South Africa 8. |
| Other do | 15 | 15 | France 7. |
| Steel, primary forms do | 2,008 | 2,296 | Belgium-Luxembourg 513; Netherlands 438; Austria 244. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, and sections do | 3,727 | 3,178 | Belgium-Luxembourg 1,509; France 604; Italy 315. |
| Universals, plates, and sheets do | 4,092 | 3,790 | Belgium-Luxembourg 1,323; France 781; Japan 298. |
| Hoop and strip do | 570 | 569 | Belgium-Luxembourg 289; France 127; Netherlands 78. |
| Rails and accessories do | 28 | 29 | Netherlands 13; Belgium-Luxembourg 5; Sweden 3. |
| Wire do | 165 | 184 | Belgium-Luxembourg 93; France 37. |
| Tubes, pipes, and fittings do | 641 | 617 | Netherlands 156; Belgium-Luxembourg 87; France 69. |
| Castings and forgings, rough do | 37 | 34 | Romania 12; Belgium-Luxembourg 5; Netherlands 5. |
| Lead: | | | |
| Ore and concentrate | 200,858 | 162,265 | Ireland 43,251; Sweden 42,169; Canada 27,912. |
| Oxides | 4,961 | 4,362 | Belgium-Luxembourg 2,231; Mexico 695. |
| Metal including alloys: | | | |
| Scrap | 17,052 | 31,007 | Netherlands 9,748; France 6,330; United States 3,238. |
| Unwrought | 122,025 | 136,143 | United Kingdom 46,250; Sweden 21,422; Australia 17,937. |
| Semimanufactures | 2,918 | 2,741 | Belgium-Luxembourg 1,345; Yugoslavia 551; France 536. |
| Magnesium: | | | |
| Oxide, hydroxide, peroxide | 3,244 | 6,859 | United States 3,518; France 1,145; Netherlands 1,002. |
| Metal including alloys: | | | |
| Scrap | 1,483 | 4,216 | Czechoslovakia 3,639. |
| Unwrought | 38,512 | 45,031 | Norway 21,667; United States 7,966; France 6,405. |
| Semimanufactures | r 95 | 276 | United States 228; France 26. |
| Manganese: | | | |
| Ore and concentrate thousand tons | 476 | 716 | Republic of South Africa 376; Australia 176; Republic of Congo 70. |
| Oxides | 1,547 | 2,148 | Belgium-Luxembourg 1,395; Japan 620. |
| Metal | r 3,978 | 5,020 | France 1,450; Republic of South Africa 1,421; Japan 1,302. |
| Mercury 76-pound flasks | r 14,026 | 19,380 | Spain 7,008; U.S.S.R. 3,896; Italy 3,365. |
| Molybdenum: | | | |
| Ore and concentrate | 14,192 | 18,795 | United States 10,894; Netherlands 3,167. |
| Metal including alloys, all forms | 282 | 421 | Austria 236; United States 55. |
| Nickel: | | | |
| Ore and concentrate | 4 | 20 | NA. |
| Matte and speiss | 2,309 | 3,587 | Canada 3,467. |

See footnotes at end of table.

## Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Nickel—Continued | | | |
| Metal including alloys: | | | |
| Scrap | 7,009 | 6,968 | United States 1,761; Belgium-Luxembourg 926; France 877. |
| Unwrought | 35,126 | 34,469 | United Kingdom 6,857; Norway 5,515; Canada 5,337. |
| Semimanufactures | 2,238 | 3,193 | United Kingdom 905; Australia 768; France 552. |
| Platinum-group metals and silver: | | | |
| Waste and sweepings kilograms | 435,039 | 303,115 | United Kingdom 63,121; United States 62,970; Norway 41,959. |
| Metals including alloys, all forms: | | | |
| Platinum group thousand troy ounces | 769 | 723 | U.S.S.R. 237; United Kingdom 164; United States 128. |
| Silver do | 73,970 | 64,536 | United Kingdom 14,625; United States 9,706; Belgium-Luxembourg 7,450. |
| Tin: | | | |
| Ore and concentrate long tons | 6,502 | 8,678 | Bolivia 8,653. |
| Oxides do | 184 | 159 | Japan 68; France 38. |
| Metal including alloys: | | | |
| Scrap do | 269 | 242 | Netherlands 83; Switzerland 58. |
| Unwrought do | 15,488 | 15,906 | Thailand 4,577; Indonesia 4,144; Malaysia 2,641. |
| Semimanufactures do | 236 | 382 | Netherlands 249; United Kingdom 73; Switzerland 45. |
| Titanium: | | | |
| Ore and concentrate | 457,499 | 489,924 | Norway 347,785; Canada 85,176. |
| Oxides | 18,331 | 24,613 | Belgium-Luxembourg 9,790; Netherlands 5,426; France 3,494. |
| Metal including alloys, all forms | 1,485 | 3,070 | U.S.S.R. 2,152; Japan 382. |
| Tungsten: | | | |
| Ore and concentrate | 6,226 | 6,886 | People's Republic of China 1,874; France 1,090; North Korea 673. |
| Metal including alloys, all forms | 345 | 429 | France 96; Austria 94; United States 75. |
| Uranium and thorium: | | | |
| Ore and concentrate | 1,884 | 400 | All from Australia. |
| Uranium, thorium, and rare-earth compounds | 504 | 713 | France 285; United States 154; United Kingdom 132. |
| Metal including alloys, all forms kilograms | 12,500 | 33,500 | United Kingdom 30,300. |
| Vanadium metal including alloys, all forms | 44 | 27 | United States 18; Belgium-Luxembourg 9. |
| Zinc: | | | |
| Ore and concentrate | 501,415 | 622,593 | Canada 294,990; Sweden 79,301; Ireland 58,896. |
| Oxide and peroxide | 7,098 | 5,718 | France 1,928; Belgium-Luxembourg 981; Netherlands 840. |
| Metal including alloys: | | | |
| Scrap | 2,327 | 3,767 | Denmark 1,123; Netherlands 689; Belgium-Luxembourg 306. |
| Dust | 11,144 | 12,486 | Belgium-Luxembourg 11,291. |
| Unwrought | 144,360 | 116,251 | Belgium-Luxembourg 71,665; Netherlands 15,572; France 5,497. |
| Semimanufactures | 18,971 | 22,827 | France 11,315; Yugoslavia 4,278; Belgium-Luxembourg 3,224. |
| Zirconium metal including alloys, all forms | 177 | 174 | United States 146. |
| Other: | | | |
| Ores and concentrates: | | | |
| Of columbium, tantalum, vanadium and zirconium | 37,114 | 43,438 | Australia 36,541. |
| Of precious metals | 5 | -- | |
| Of base metals, n.e.s | 1,981 | 1,839 | Australia 1,700. |
| Ash and residue containing nonferrous metals | 169,416 | 284,109 | Canada 106,460; Italy 25,288; Netherlands 16,564. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | 6,814 | 9,513 | Switzerland 2,203; Belgium-Luxembourg 2,034; France 1,352. |

See footnotes at end of table.

## Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Other—Continued | | | |
| Metals, including alloys, all forms: | | | |
| Metalloids: | | | |
| Arsenic and tellurium | 98 | 52 | Sweden 25; Belgium-Luxembourg 10; Japan 6. |
| Selenium and phosphorus | 24,763 | 24,496 | NA. |
| Silicon | 30,861 | 41,252 | Norway 12,770; France 11,478; Yugoslavia 4,707. |
| Alkali, alkali earth, rare-earth metals | 706 | 960 | France 907. |
| Pyrophoric alloys | 57 | 74 | United Kingdom 31; France 24; Denmark 12. |
| Base metals including alloys, all forms, n.e.s | r 807 | 467 | Sweden 284; United States 64; Austria 45. |
| NONMETALS | | | |
| Abrasives: | | | |
| Natural: | | | |
| Pumice, emery, natural corundum, etc | 133,531 | 176,712 | Greece 120,387; Italy 49,335. |
| Dust and powder of precious and semiprecious stones thousand carats | 5,103 | 6,479 | United States 2,792; Ireland 2,341. |
| Grinding and polishing wheels and stones | 5,035 | 5,867 | Austria 1,261; Italy 1,164; France 620. |
| Artificial: | | | |
| Corundum | 8,789 | 16,193 | Austria 4,376; Netherlands 4,269; Hungary 3,120. |
| Silicon carbide | 15,214 | 25,858 | Norway 10,065; Italy 9,539; Netherlands 2,461. |
| Asbestos | 206,602 | 332,707 | Canada 240,593; U.S.S.R. 32,416; Italy 29,742. |
| Barite and witherite | r 90,330 | 128,686 | Turkey 40,622; Czechoslovakia 20,606. |
| Boron materials: | | | |
| Crude natural borates | r 163,690 | 154,849 | United States 82,814; Turkey 68,112. |
| Oxide and acid | 14,884 | 16,827 | France 5,106; Turkey 4,922; United States 3,966. |
| Bromine | 1,631 | 1,400 | Israel 792; United Kingdom 442. |
| Cement thousand tons | 892 | 777 | France 311; Belgium-Luxembourg 161; Sweden 126. |
| Chalk do | 77 | 82 | France 77. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays: | | | |
| Fire clay do | 230 | 224 | Czechoslovakia 91; United States 37; Republic of South Africa 34. |
| Kaolin do | 645 | 714 | United Kingdom 454; United States 91; Czechoslovakia 75; France 73. |
| Kyanite, sillimanite, andalusite, and mullite do | r 15 | 19 | Republic of South Africa 8; India 5. |
| Other do | 282 | 296 | Netherlands 84; Czechoslovakia 52; United States 39. |
| Products: | | | |
| Refractory (including nonclay bricks) do | r 252 | 247 | Austria 76; Czechoslovakia 39; France 28. |
| Nonrefractory do | 1,195 | 1,230 | Netherlands 568; Italy 263; France 130. |
| Cryolite and chiolite | 1,687 | 3,536 | Mainly from Denmark. |
| Diamond: | | | |
| Gem: | | | |
| Crude or rough cut thousand carats | 150 | 130 | NA. |
| Other do | 435 | 490 | Belgium-Luxembourg 255; Israel 115. |
| Industrial do | 605 | 735 | Belgium-Luxembourg 275; Netherlands 205. |
| Diatomite and other infusorial earth | r 55,194 | 59,918 | Denmark 43,809; France 8,028; United States 6,497. |
| Feldspar, leucite, nepheline and nepheline syenite | 92,026 | 107,571 | Norway 79,030; France 11,990; Italy 11,782. |

See footnotes at end of table.

**Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 596 | 506 | All from Chile. |
| Phosphatic thousand tons | 2,865 | 2,849 | United States 1,305; U.S.S.R. 928; Morocco 388. |
| Manufactured: | | | |
| Nitrogenous | 849,764 | 774,826 | Belgium-Luxembourg 273,199; Romania 123,753; Yugoslavia 94,949. |
| Phosphatic: | | | |
| Thomas slag | 493,265 | 647,663 | Belgium-Luxembourg 609,877. |
| Other | 31,904 | 50,270 | Mainly from Netherlands. |
| Potassic | 63,513 | 82,676 | France 48,656; Canada 30,314. |
| Mixed | 251,037 | 231,927 | France 102,042; Yugoslavia 49,300; United Kingdom 34,216. |
| Ammonia, anhydrous | r 197,901 | 220,780 | Netherlands 100,398; France 95,772. |
| Fluorspar | 158,453 | 207,613 | Spain 41,988; Italy 11,642. |
| Graphite, natural | r 22,075 | 22,199 | People's Republic of China 4,625; Austria 4,446. |
| Gypsum and plasters | 242,262 | 274,820 | Austria 142,103; France 97,935. |
| Iodine | 956 | 756 | Japan 647; Chile 105. |
| Lime | 187,366 | 165,310 | France 155,953. |
| Lithium minerals | 6,862 | 5,238 | Republic of South Africa 4,008; Netherlands 1,058. |
| Magnesite | 357,578 | 352,246 | Greece 121,207; Austria 83,952; Italy 30,768. |
| Mica: | | | |
| Crude, including splittings and waste | 8,520 | 8,722 | India 2,537; Argentina 2,280; United Kingdom 816. |
| Worked, including agglomerated splittings | r 474 | 613 | France 327; Belgium-Luxembourg 158. |
| Pigments, mineral: | | | |
| Natural, crude | r 1,680 | 1,946 | Austria 1,550. |
| Iron oxides and hydroxides | 1,428 | 1,872 | France 499; Netherlands 320; Belgium-Luxembourg 190. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural | 1,513 | 2,192 | Brazil 1,134; Republic of South Africa 202. |
| Manufactured | 21 | 19 | Switzerland 13; France 3. |
| Pyrite (gross weight) thousand tons | r 1,106 | 892 | U.S.S.R. 444; Norway 395. |
| Salt | 493,428 | 748,847 | Netherlands 582,343; France 91,368; Belgium-Luxembourg 43,511. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 147,067 | 98,606 | Mainly from Belgium-Luxembourg. |
| Caustic potash, sodic, potassic peroxides | 6,964 | 498 | Sweden 211; Czechoslovakia 167. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous | 224,644 | 212,912 | Austria 74,705; Italy 44,538; Portugal 23,384. |
| Slate | r 15,040 | 16,438 | Spain 4,991; United Kingdom 4,928; Portugal 2,749. |
| Other | 409,968 | 316,762 | Sweden 68,664; Denmark 44,471; Austria 38,741. |
| Worked: | | | |
| Building and monumental stone | 452,747 | 521,708 | Italy 462,352. |
| Paving and flagstone | 128,042 | 130,071 | Portugal 77,343; Poland 18,729; Romania 16,882. |
| Slate | 11,848 | 11,881 | Italy 5,806; United Kingdom 1,700; Spain 1,662. |
| Dolomite | 637,474 | 830,232 | Belgium-Luxembourg 748,867. |
| Gravel and crushed stone thousand tons | r 16,454 | 17,684 | France 10,560; Denmark 3,658. |
| Limestone do | 1,709 | 1,776 | Austria 1,148; Sweden 243; Belgium-Luxembourg 156. |
| Quartz and quartzite: | | | |
| Quartz crystal kilograms | 141 | 104 | Japan 62; Switzerland 13. |
| Other | r 84,510 | 112,915 | Belgium-Luxembourg 40,901; Sweden 28,887; Netherlands 19,909. |
| Sand, excluding metal-bearing thousand tons | 2,897 | 3,500 | France 2,602; Begium-Luxembourg 328. |

See footnotes at end of table.

## Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Sulfates, natural, magnesium sulfate (Kieserite) | -- | 10 | NA. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 414,444 | 490,311 | Poland 269,133; United States 111,533. |
| Colloidal | 154 | 276 | France 175; Italy 66. |
| Sulfur dioxide | r 74 | 244 | NA. |
| Sulfuric acid | 107,950 | 105,386 | Mainly from Belgium-Luxembourg. |
| Talc, steatite, and soapstone | 90,399 | 101,726 | Austria 33,454; Italy 18,304; France 17,871. |
| Vermiculite, chlorite, perlite | 83,254 | 94,904 | Greece 60,867; Hungary 12,688; Republic of South Africa 11,224. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Meerschaum, amber, jet | r 2,181 | 6,498 | Spain 6,486. |
| Pottery | 14,667 | 70,475 | France 20,467; Netherlands 19,044; U.S.S.R. 9,013. |
| Other | 503,930 | 374,310 | France 163,685; Austria 100,607; Norway 57,542. |
| Slag, dross and similar waste, not metal bearing: | | | |
| From iron and steel manufacture, thousand tons | 1,868 | 1,608 | France 822; Belgium-Luxembourg 656; Netherlands 353. |
| Slag and ash, n.e.s., do | 103 | 121 | Denmark 43; Belgium-Luxembourg 41; Czechoslovakia 22. |
| Oxide and hydroxide of strontium and barium | 344 | 470 | Spain 300; United States 97. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s. | r 207,093 | 158,778 | Mainly from Belgium-Luxembourg. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 21,851 | 14,425 | Trinidad and Tobago 9,404; United States 4,648. |
| Carbon black | 37,572 | 44,623 | Netherlands 20,446; United States 6,753; France 6,411. |
| Coal and briquets: | | | |
| Anthracite and bituminous, thousand tons | 6,930 | 7,021 | Poland 1,795; United Kingdom 1,555; United States 1,327. |
| Briquets of anthracite and bituminous coal, do | 94 | 86 | Netherlands 71; Belgium-Luxembourg 13. |
| Lignite and lignite briquets, do | 1,209 | 1,253 | Czechoslovakia 1,249. |
| Coke and semicoke, do | 846 | 1,281 | United States 523; France 169; Belgium-Luxembourg 168. |
| Gas, natural, do | 11,943 | 15,628 | NA. |
| Helium and other rare gases | 1,915 | 5,123 | Mainly from Netherlands. |
| Peat and briquets, thousand tons | 26 | 22 | Netherlands 12; Poland 6; U.S.S.R. 2. |
| Petroleum: | | | |
| Crude and partly refined, thousand 42-gallon barrels | 757,647 | 816,567 | Libya 187,622; Saudi Arabia 185,527; Iran 104,079; Algeria 103,860. |
| Refinery products: | | | |
| Gasoline, motor spirit, do | 31,816 | 28,466 | Netherlands 11,874; France 3,621; Italy 3,553. |
| Kerosine, white spirit, do | 9,370 | 9,951 | Netherlands 7,701. |
| Distillate fuel oil, do | 151,460 | 169,887 | Netherlands 88,595; Italy 21,761; U.S.S.R. 16,807. |
| Residual fuel oil, do | 33,706 | 33,520 | Netherlands 18,568; France 5,554; Belgium-Luxembourg 2,677. |
| Lubricants, do | 1,631 | 1,576 | United Kingdom 396; Netherlands 258; United States 250. |
| Other: | | | |
| Mineral jelly and wax, do | 840 | 1,104 | Netherlands 295; France 115. |
| Unspecified, do | 39,004 | 52,402 | Netherlands 30,219; United States 8,743. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals, thousand tons | r 657 | 617 | Netherlands 307; Belgium-Luxembourg 103; France 62. |

r Revised. NA Not available.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Production of primary aluminum in 1974 amounted to 689,000 tons, up 29% over production in 1973. Production of secondary aluminum remained essentially unchanged at 327,000 tons. Imports of unwrought aluminum decreased by about 16%, while exports increased by 64.5%. Apparent consumption was up 1.8%. The aluminum balance for 1974 compared with 1973 is given in the following tabulation, in thousand tons:

| | 1973 | 1974 [e] | Change (percent) |
|---|---|---|---|
| Production: | | | |
| Primary metal | 532.7 | 689 | +29.2 |
| Secondary metal [1] | 331.0 | 327 | −1 |
| Total | 863.7 | 1,016 | +17.7 |
| Imports, unwrought aluminum | +407.0 | +343 | −15.7 |
| Exports, unwrought aluminum | −106.4 | −175 | +64.5 |
| Stock changes | +8.4 | +6 | -- |
| Apparent consumption | 1,139.0 | 1,160 | +1.8 |

[e] Estimated.
[1] Excluding ingots made on toll or by other arrangements from scrap of the first processing stage.

Heavy international demand for aluminum in 1973 continued into 1974 and resulted in a depletion of stocks. Consequently, the German aluminum industry was able to operate at near capacity in spite of the general economic slowdown.

Production of semiproducts rose 6% to 820,000 tons in 1974. Exports of semiproducts increased by 41% to 152,000 tons, accounting for most of the production increase.

The foundry sector was affected by the recession in the automobile industry, and production of castings decreased by almost 6% in comparison with 1973 production.

As a result of an antipollution suit, Reynolds Aluminium Hamburg GmbH was ordered to restrict its production to two-thirds of its 100,000-ton capacity until late 1975.

**Copper.**—Mine production of copper (recoverable copper content) in 1974 was 1,734 tons, up 20.8% from 1973 production. Smelter production was 258,611 tons, a decrease of 18% from that of 1973, and production of refined copper increased 4.2% over 1973 production to 423,600 tons. Consumption of refined copper declined slightly from 1973 consumption to a total of 723,800 tons.

**Iron Ore.**—Production of iron ore and concentrate, after showing an increase in 1973, resumed the downward trend of previous years and decreased 12.4% to 4.4 million tons in 1974. Iron content, which averaged 32%, was equivalent to 1.4 million tons.

In terms of iron content, domestic ore supplied about 4% of the iron ore requirements for pig iron production in 1974, the balance being supplied by imported ore. Iron ore imports in 1974 totaled 57.7 million tons. The three principal suppliers of iron ore to West Germany were Brazil, with 12.0 million tons, Sweden with 10.6 million tons, and Liberia with 9.7 million tons.

**Iron and Steel.**—Pig iron production, including blast furnace ferroalloys, achieved a record high of 40.2 million tons in 1974, 9.2% above 1973 production. Production of both raw and finished steel also attained record highs in 1974. Raw steel production was 53.2 million tons, 7.5% above the previous high of last year, while finished steel production was 39.6 million tons, up 7.9% from 1973. West Germany continued as the largest steel producer in the European Communities (EC) with 34% of the total as compared with 33% in 1973. West Germany's share of world raw steel production in 1974 increased slightly to 7.5% from 7% last year. West German steel plants were operating at 88% of capacity in 1974 as compared with 84% of in 1973. The high level of production was sustained mainly through exports, which increased by 28% over that of 1973. About

37% of finished steel production was exported compared with 29% in 1973. Domestic shipments increased by about 1% in spite of a drop of 3% in domestic consumption, due mainly to decreased imports of steel. Wages and salaries increased 12%, which, combined with a slight increase in the average number of employees, raised wage and salary cost to the industry by 15%.

Of the steel produced, 68.8% came from the basic oxygen process, 17.4% from the open-hearth process, 10.8% from the electric furnace process, and 3.0% from the basic Bessemer (Thomas) process.

The total new ferrous scrap supply amounted to 28.2 million tons. Consumption was 20.9 million tons in the iron and steel industry and 4.6 million tons in the foundry industry, for a total of 25.5 million tons. Imports of ferrous scrap amounted to 1.8 million tons of which about 95% came from the EC; exports were 2.5 million tons of which about 94% was destined for EC countries.

Most West German steel producers increased their output in 1974. The leader, August Thyssen–Hütte AG (ATH) in the Ruhr area, advanced from sixth to fifth place in the list of the world's largest steel producers. ATH, which remained the second largest steel producer in the EC, after the British Steel Corp., increased its raw steel production by 9% to 17.1 million tons. The EC Commission approved the progressive acquisition of 25% of the capital of Société Lorraine et Méridionale de Laminage Continu (SOLMER), the French steel concern at Fos-sur-Mer, near Marseilles. The combined West German-Netherlands company, ESTEL N.V. Hoesch-Hoogovens, formed in 1972, produced 12.2 million tons of raw steel in 1974, about half of which was produced by the German branch, Hoesch Hüttenwerke AG. The Netherlands branch, Koninklijke Netherlandsche Hoogovens en Staalfrabrieken, N.V. (KNHS), located at IJmuiden, is planning to increase its proportion of the group's raw steel production. Its location on the coast is favorable for the use of seaborne ore and coal. The Government-owned Stahlwerke Peine-Salzgitter AG in Lower Saxony produced 5.5 million tons of raw steel, 6% above 1973 production.

The Ruhr firm of Mannesmann AG, most of whose output is in the form of pipe, produced 5.1 million tons in 1974, up 11% from 1973. Fried. Krupp Hüttenwerke AG, also located in the Ruhr Valley, increased its production by 5% to 4.5 million tons of steel in 1974. The company's capacity is being expanded to 7 million tons per year. A new, large blast furnace is being built at Krupp's Rheinhausen plant. The furnace, scheduled to begin production in 1976, will have a hearth diameter of 11.5 meters, a usable volume of 2,355 cubic meters and an annual capacity of 1.8 million tons. It is the first of three large blast furnaces planned by the firm. In July, the Government of Iran acquired a 25.04% interest in this subsidiary of Fried. Krupp GmbH. Klöckner-Werke AG increased its raw steel ouptut by 15% to 3.6 million tons, but experienced production difficulties with its large blast furnace and slab caster at the Bremen plant. Output of the firm was therefore well below capacity.

Other large steel producers in West Germany were Stahlwerke Röchling-Burbach GmbH, which had a 13% increase in raw steel production to 3.4 million tons, and Dillinger Hüttenwerke AG, which had a 14% production increase to 2.4 million tons. Both firms are located in the Saarland. Dillinger Hüttenwerke began operation of a new blast furnace, having a hearth diameter of 10 meters and a volume of 1,790 cubic meters. The furnace is equipped with two hot-blast stoves and has a capacity of 2,800 to 3,000 tons per day, which could be raised to 4,500 to 5,000 tons per day with the addition of a third stove.

The merchant pig iron producer, Duisburger Kupferhütte, recently began operation of a new blast furnace with a hearth diameter of 5.5 meters and a volume of 660 cubic meters, replacing an older furnace. Two forthcoming mergers in the West German specialty steel industry will concentrate production in two major groups. ATH will take over Edelstahlwerk Witten A.G., Witten/Ruhr, and Fried. Krupp Hüttenwerke will acquire Stahlwerke Südwestfalen AG, Hüttental-Geisweid. When these mergers, which are awaiting approval by the EC authorities, are complete, the two groups will control about 80% of West German specialty steel production.

The basic agreement for the construction of a direct-reduction steelworks in Kursk, U.S.S.R. by the West German

firms of Salzgitter AG, Korf-Stahl AG, and Fried. Krupp Hüttenwerke was signed in March 1974. The first stage of the project will involve construction of an iron-oxide pellet plant with a capacity of 3.5 million to 4 million tons per year, a direct-reduction plant having a capacity of about 2.5 million tons per year, an electric furnace shop and continuous casting facilities, and a rolling mill. Negotiations on the second phase are to take place in 1976. There is provision for long-term deliveries of prereduced pellets and semifinished steel to West Germany.

Foreign trade in iron and steel for principal categories, in million tons, was as follows:

| | 1973 | 1974 p |
|---|---|---|
| Exports: | | |
| Ferrous scrap | 2.3 | 2.5 |
| Pig iron and ferroalloys | 1.2 | 1.4 |
| Semifinished steel, including coils | 2.6 | 2.6 |
| Finished rolled and forged steel | 13.3 | 17.6 |
| Imports: | | |
| Ferrous scrap | 1.5 | 1.8 |
| Pig iron and ferroalloys | .4 | .3 |
| Semifinished steel, including coils | 2.3 | 2.0 |
| Finished rolled and forged steel | 7.8 | 6.2 |

p Preliminary.

Iron and steel trade with the United States, in thousand tons, was as follows:

| | 1973 | 1974 p |
|---|---|---|
| Exports to United States: | | |
| Pig iron, ferroalloys, scrap | 3 | 5 |
| Ingots and semifinished steel | -- | 4 |
| Coils | 313 | 235 |
| Finished hot-rolled and forged steel | 1,615 | 1,646 |
| Imports from United States: | | |
| Pig iron, ferroalloys, scrap | 17 | 8 |
| Ingots and semifinished steel | 41 | 11 |
| Coils | 22 | .5 |
| Finished hot-rolled and forged steel | 27 | 13 |

p Preliminary.

Source: U.S. Embassy, Düsseldorf, West Germany. State Department Airgram A–74, June 5, 1975.

**Table 5.—Federal Republic of Germany: Scrap supply and consumption**
(Thousand metric tons)

| | 1972 | 1973 | 1974 |
|---|---|---|---|
| Home (revert) scrap: | | | |
| Iron and steel plants | 9,149 | 10,363 | 10,930 |
| Foundries | 2,456 | 2,626 | 2,475 |
| Purchases: | | | |
| Domestic | 8,740 | 9,257 | 9,193 |
| Imported | 1,187 | 1,358 | 1,737 |
| Other, including variation in stock estimates | 2,787 | 3,508 | 3,871 |
| Total new supply | 24,319 | 27,112 | 28,206 |
| Consumption: | | | |
| Iron and steel plants | 18,196 | 20,051 | 20,936 |
| Iron and steel foundries | 4,510 | 4,925 | 4,636 |
| Consigned for export | 1,939 | 2,319 | 2,375 |
| Stocks at yearend | 1,838 | 1,656 | 1,915 |

Source: Statistisches Bundesamt, Düsseldorf. Eisen und Stahl, 4th quarter, 1974.

## Table 6.—Federal Republic of Germany: Salient statistics of the iron and steel industry [1]

(Thousand metric tons unless otherwise specified)

| | 1972 | 1973 | 1974 |
|---|---|---|---|
| **PIG IRON** | | | |
| Blast furnaces available ---- number | 89 | 88 | 86 |
| Blast furnaces in operation at yearend ---- do | 78 | 76 | 76 |
| Maximum production capacity | 42,700 | r 44,310 | p 46,680 |
| Production: | | | |
| For steelmaking: | | | |
| High phosphorus | 11,802 | 9,840 | 10,400 |
| Low phosphorus | 18,331 | 24,900 | 27,549 |
| Foundry iron: | | | |
| High phosphorus | 206 | 186 | 155 |
| Low phosphorus | 933 | 1,089 | 1,172 |
| Pig iron for nodular iron | 416 | 447 | 507 |
| Spiegeleisen and blast furnace ferromanganese | 210 | 247 | 320 |
| Other pig iron and blast furnace ferrosilicon | 105 | 120 | 118 |
| Total | 32,003 | [2]36,828 | 40,221 |
| Blast furnace charge: | | | |
| Iron ore: | | | |
| Domestic | 748 | 770 | 859 |
| Iron content | 277 | 281 | 294 |
| Imported | 14,226 | 19,248 | 21,560 |
| Iron content | 8,632 | 11,785 | 13,006 |
| Sinter and briquets | 35,942 | 38,806 | 42,224 |
| Iron content | 20,012 | 21,713 | 23,664 |
| Manganese ore | 431 | 514 | 674 |
| Iron content | 49 | 67 | 84 |
| Other iron-bearing materials: | | | |
| Slag, scale, cinder, dust | 3,003 | 3,031 | 2,884 |
| Scrap | 690 | 608 | 558 |
| Limestone | 868 | 1,104 | 1,147 |
| Phosphate | 177 | 117 | 172 |
| Coke: | | | |
| Total | 15,598 | 18,221 | 20,806 |
| Kilograms per ton of iron produced | 486 | 495 | 517 |
| **STEEL** | | | |
| Converters: | | | |
| Basic bessemer: | | | |
| Total ---- number | 14 | 9 | 9 |
| In operation at end of year ---- do | 14 | 9 | 9 |
| Oxygen: | | | |
| Total ---- do | 44 | 47 | 48 |
| In operation at end of year ---- do | 33 | 39 | 40 |
| Furnaces: | | | |
| Open hearth: | | | |
| Total ---- do | 85 | 83 | 77 |
| In operation at end of year ---- do | 54 | 57 | 58 |
| Electric: | | | |
| Total ---- do | 179 | 180 | 157 |
| In operation at end of year ---- do | 160 | 158 | 144 |
| Maximum production capacity (all furnaces) | 57,000 | r 58,800 | p 60,665 |
| Production of raw steel: | | | |
| Basic bessemer | 2,662 | 1,729 | 1,579 |
| Oxygen | 28,229 | 33,596 | 36,613 |
| Open hearth | 8,331 | 9,040 | 9,287 |
| Electric | 4,479 | 5,150 | 5,748 |
| Other | 4 | 6 | 5 |
| Total | 43,705 | 49,521 | 53,232 |
| Ingots | 43,154 | 48,924 | 52,602 |
| Liquid steel for castings | 552 | 597 | 629 |
| Furnace feed for ingot steel: | | | |
| Pig iron: | | | |
| Total | 29,705 | 33,922 | 36,952 |
| Kilograms per ton raw steel | (688) | (693) | (702) |
| Scrap: | | | |
| Total | 17,493 | 19,439 | 20,373 |
| Kilograms per ton raw steel | (405) | (397) | (387) |
| Premelted steel | 6 | 4 | 3 |
| Ferroalloys and alloying metals | 433 | 549 | 622 |
| Other iron-bearing materials | 1,039 | 1,275 | 1,528 |
| Iron and manganese ores | 680 | 990 | 1,121 |
| Total iron-bearing materials | 49,356 | 56,179 | 60,599 |
| Limestone | 3,009 | 3,368 | 3,779 |
| **CASTINGS** | | | |
| Production of iron and steel castings | 4,114 | 4,492 | 4,459 |
| Consumption of raw materials: | | | |
| Pig iron | 1,821 | 1,970 | 2,090 |
| Scrap | 4,510 | 4,925 | 4,636 |
| Ferroalloys and other metals | 85 | 100 | 103 |
| Total | 6,416 | 6,995 | 6,829 |

See footnotes at end of table.

## Table 6.—Federal Republic of Germany: Salient statistics of the iron and steel industry [1]—Continued

(Thousand metric tons unless otherwise specified)

| | 1972 | 1973 | 1974 |
|---|---|---|---|
| EMPLOYMENT | | | |
| Steelworks ---------- persons -- | 339,525 | 345,489 | 343,995 |
| Iron and steel foundries [3] ---------- do ---- | 111,265 | 108,513 | 104,883 |

r Revised. p Preliminary.
[1] Data differs from that in table 7, because of difference in source.
[2] Data may not add to total shown because of independent rounding.
[3] Statistisches Bundesamt, Wiesbaden. Industrie und Handwerk, Reihe 1, December 1974.

Source: Statistisches Bundesamt, Düsseldorf. Eisen und Stahl, 4th quarter, 1974.

## Table 7.—Federal Republic of Germany: Raw materials consumed in the production of pig iron [1]

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 |
|---|---|---|---|
| Iron ore: | | | |
| Domestic ---------- | 5,145 | 4,975 | 4,424 |
| Imported ---------- | 42,144 | 49,938 | 55,646 |
| Total ---------- | 47,289 | 54,913 | 60,070 |
| Manganese ore ---------- | 570 | 675 | 898 |
| Pyrite cinder ---------- | 2,243 | 2,155 | 2,282 |
| Slags and plant scale ---------- | 5,754 | 5,902 | 6,114 |
| Blast furnace dust ---------- | 1,534 | 1,485 | 1,303 |
| Scrap ---------- | 699 | 608 | 558 |
| Total metallic raw materials, gross weight ---------- | 58,089 | 65,738 | 71,225 |
| Iron content of total metallic raw materials: | | | |
| Iron ore: | | | |
| Domestic ---------- | r 1,641 | r 1,573 | 1,387 |
| Imported ---------- | 24,496 | 29,642 | 32,821 |
| Manganese ore ---------- | 56 | 74 | 98 |
| Pyrite cinder ---------- | 1,090 | 1,040 | 1,107 |
| Slags and plant scale ---------- | 2,620 | 2,709 | 2,856 |
| Blast furnace dust ---------- | 575 | 572 | 488 |
| Scrap ---------- | 565 | 489 | 442 |
| Total iron content ---------- | 31,043 | 36,099 | 39,199 |
| Limestone ---------- | 4,059 | 5,293 | 6,196 |
| Phosphate ---------- | 178 | 131 | 205 |
| Total metallic raw materials, limestone, and phosphate, gross weight ---------- | 62,326 | 71,162 | 77,626 |
| Coke ---------- | 15,598 | 18,221 | 20,806 |

r Revised.
[1] Data differs from that in table 6, because of difference in source.

## Table 8.—Federal Republic of Germany: Production of sinter and consumption of raw materials

(Thousand metric tons)

| | 1972 | 1973 | 1974 |
|---|---|---|---|
| Production: | | | |
| Gross weight ---------- | 36,175 | 39,320 | 42,808 |
| Iron content ---------- | 20,215 | 22,104 | 24,062 |
| Consumption of raw materials: | | | |
| Iron ore ---------- | 32,454 | 35,056 | 37,875 |
| Cinder ---------- | 2,207 | 2,115 | 2,243 |
| Slags and scale ---------- | 2,788 | 2,922 | 3,282 |
| Blast furnace dust ---------- | 1,534 | 1,473 | 1,289 |
| Limestone ---------- | 3,191 | 4,189 | 5,049 |
| Iron content of materials consumed: | | | |
| Iron ore ---------- | 17,236 | 19,157 | 20,923 |
| Cinder ---------- | 1,082 | r 1,033 | 1,100 |
| Slags and scale ---------- | 1,516 | 1,584 | 1,722 |
| Blast furnace dust ---------- | 575 | 569 | 485 |
| Total ---------- | 20,409 | 22,343 | 24,230 |

r Revised.

Table 9.—Federal Republic of Germany: Production of finished steel
(Thousand metric tons)

| | 1972 | 1973 | 1974 |
|---|---|---|---|
| Wire rods | 3,780 | 4,286 | 4,730 |
| Bars and rods | 5,335 | 6,416 | 6,904 |
| Angles, shapes, sections (excluding rails) | 2,224 | 2,487 | 2,545 |
| Universal mill plates | 409 | 502 | 563 |
| Other heavy plates and sheets (more than 4.75 millimeters thick) | 4,582 | 5,199 | 6,232 |
| Medium plates and sheets (3 to 4.75 millimeters) | 458 | 590 | 478 |
| Thin plates and sheets (less than 3 millimeters) | 7,025 | 8,366 | 8,332 |
| Hot rolled strip including skelp | 2,676 | 3,043 | 2,994 |
| Hot rolled wide strip | 2,718 | 3,267 | 3,936 |
| Rails and railway track material | 409 | 518 | 582 |
| Seamless steel tubes | 1,576 | 2,031 | 2,319 |
| Total finished steel[1] | 31,192 | r 36,706 | 39,615 |
| Selected semimanufactures: | | | |
| Tinplate | 756 | 806 | 911 |
| Galvanized and terneplate | 1,320 | 1,472 | 1,344 |
| Welded steel pipe | 2,059 | 2,067 | 2,216 |
| Extrusions and forgings | 526 | r 612 | 678 |
| Steel castings | 284 | 312 | 339 |

r Revised.
[1] Data may not add to totals shown because of independent rounding.

**Lead and Zinc.**—Mine output of lead (lead content of ore) in 1974 was 30,500 tons, down 12.5% from 1973 production. Mine production of zinc (zinc content of ore) was 116,000 tons, 5.6% below that of the previous year. Smelter production of lead consisted of 116,000 tons of primary and 205,000 tons of secondary lead for a total of 321,000 tons, which was 5.9% above the 1973 total of 303,000 tons. Production of slab zinc amounted to 400,000 tons compared with 395,000 tons in 1973, an increase of 1.3%.

**Uranium.**—West Germany now has 11 nuclear power stations in commission, with a total capacity of over 3,200 megawatts. There are also 13 other nuclear power stations under construction or on order. By 1980, nuclear power generating capacity should approximate 20,000 megawatts and should provide about 25% of all power needs.

In July the first 1,200-megawatt section of the Biblis nuclear power station near Worms in the Upper Rhineland went into operation. In August another smaller reactor at Niederaibach, Bavaria, was shutdown because performance had not measured up to expectations.

The two leading West German utilities, Rheinisch-Westfälisches Elektrizitätswerk AG (RWE) and Energie Versorgung Schwaben (EVS) have placed orders for 250,000 to 300,000 separative work units of enriched uranium from the Eurodif gaseous diffusion plant when it comes onstream in 1981. Eurodif is a joint project of France, Italy, Spain, and Belgium with a planned annual output of 9 million separative work units.

## NONMETALS

**Cement.**—Reduction in building activity led to a 13.8% decline in production of hydraulic cement to 36 million tons in 1974 from 41.0 million tons in 1973. Per capita consumption fell from 640 to 551 kilograms. Despite an increase in exports by 570,000 tons, a decline in domestic sales resulted in an overall reduction in sales of 14.3%.

Although 21 kilns were taken out of production during the year, the addition of 6 new gas- or oil-fired kilns by the industry resulted in an increase in capacity of 2 million tons, for a total capacity of 47 million tons.

**Fertilizers.**—The potash industry of West Germany is dominated by two producers, Kali und Salz AG with 90% of the output and Kali-Chemie AG with the remaining 10%. Production and sales of potash continued to grow gradually in 1974. The production of marketable potash exceeded 2.6 million tons $K_2O$ content, an increase of 3% over that of 1973. Available production capacity was utilized at an average rate of 88% as compared with 85% in 1973. Potassium chloride (muriate of potash) containing a minimum of 60% $K_2O$ accounted for 57% of total potash production. Potassium chloride with a $K_2O$ content between 50% and 59% represented 17% of the total output, and that with a $K_2O$ content less than 50% accounted for 13% of the total. The remaining 13% of output consisted of potassium sulfate or potassium magnesium sulfate.

Exports of potash accounted for 48% of the industry's production amounting to 1.3 million tons, or 4% above that of 1973. Western Europe continued to take the bulk of the exports, while exports to the United States reached 23,000 tons, up 28% from that of 1973. Exports also went to Eastern Europe, Brazil, Japan, and the Republic of South Africa.

Imports of potash remained insignificant, because of West Germany's large domestic resources.

Potash consumption from domestic production reached 1.4 million tons of $K_2O$ in 1974, about 50,000 tons more than in 1973. More than 90% of this consumption was used as fertilizers, with the remainder being consumed in chemical and related industries.

**Fluorspar.**—Fluorspar production in 1974 declined by 10.9% to 82,000 tons from 92,000 tons in 1973. Imports of fluorspar increased 37% to 285,000 tons in 1974. Spain and Italy remained the major suppliers with 56,000 and 28,000 tons, respectively.

**Sulfur.**—Recovery of sulfur from raw, sour natural gas from the deep wells in Lower Saxony has brought about a considerable increase in West German sulfur production in recent years. Production of sulfur increased 25% to 416,000 tons in 1974 from 333,000 tons in 1973, and 219,000 tons in 1972. It is expected that production of sulfur from this source will continue to increase in the next few years.

Imports of sulfur (including sublimed, precipitated, and colloidal sulfur) decreased 3.8% to 472,065 tons in 1974, whereas exports increased sharply by 103% to 144,282 tons.

The first of two 245,000-ton-per-year sulfur recovery plants at Grossenkneten, Lower Saxony, began operation at the end of 1973, and a second unit was scheduled to go onstream at the end of 1974. Both plants are operated by Gewerkschaft Brigitta und Elwerath Betriebsführungsgesellschaft GmbH, 66.6% owned by Gewerkschaft Brigitta and 33.3% by Mobil AG.

The 130,000-ton-per-year spent acid regeneration plant designed and constructed by Lurgi for Badische Anilin und Soda Fabrik AG (BASF) is now operational. This is the first such facility to be operated by BASF.

Farbwerk Hoechst AG is converting its sulfuric acid plant at Frankfurt-Hoechst from a pyrite to an elemental sulfur operation. One unit will be converted to use elemental sulfur and its capacity will be raised from 210,000 to 340,000 tons per year; a second pyrite-based unit with a capacity of 130,000 tons per year will be shutdown.

## MINERAL FUELS

As a result of the oil crisis of 1973–74, and the resultant changes in world energy markets, the West German Government, in October 1974, issued a revision of its energy policy, originally issued in September 1973. The projected annual growth rate of energy demand up to 1985 was revised downward from 4.3% to 3.2%. In terms of standard coal equivalents (SCE) the projection for 1980 was reduced by 7% from 510 million to 475 million tons, and for 1985, it was reduced by 9% from 610 million to 555 million tons. The new estimates were based on the assumptions of a lower economic growth rate and a more rational utilization of energy resources. Most of the reductions in projected energy demand were made in petroleum consumption, and greater emphasis was placed on coal and natural gas, while lignite and nuclear energy remained essentially constant as shown in the following tabulation:

| | Percent of total energy requirements | | | |
|---|---|---|---|---|
| | 1980 | | 1985 | |
| | 1973 program | 1974 revised program | 1973 program | 1974 revised program |
| Petroleum | 54 | 47 | 54 | 44 |
| Coal | 11 | 17 | 8 | 14 |
| Lignite | 8 | 7 | 6 | 7 |
| Natural gas | 16 | 18 | 15 | 18 |
| Nuclear | 9 | 9 | 15 | 15 |
| Other | 2 | 2 | 2 | 2 |
| Total | 100 | 100 | 100 | 100 |

When the program was announced, the West German Government stated that it went beyond a pure probability estimate and that it represented an orientation aid for the energy policy of the Government and for decisions by industry.

The percentage of energy requirements supplied by various sources in 1973 and 1974 was as follows:

| Energy source | Percentage of total primary energy consumption | |
|---|---|---|
| | 1973 | 1974 |
| Anthracite and bituminous coal | 22.2 | 22.6 |
| Lignite and brown coal | 8.7 | 9.6 |
| Petroleum | 55.2 | 51.5 |
| Natural gas | 10.2 | 12.7 |
| Hydroelectric power | 2.2 | 2.0 |
| Nuclear energy | 1.0 | 1.1 |
| Firewood, peat and other | .5 | .5 |
| Total | 100.0 | 100.0 |

Source: Statistik der Kohlenwirtschaft e.V. Der Kohlenbergbau in der Energiewirtschaft der Bundesrepublik im Jahre 1974. Essen, 1975, p. 103.

Total domestic energy consumption fell by 3.1% during the year, from 378.6 SCE in 1973 to 367 SCE in 1974. The two principal factors contributing to this decline were the general recession in the economy and a sharp drop in the consumption of petroleum.

**Coal and Lignite.**—Coal production (anthracite and bituminous) declined by 2.5% to 94.9 million tons in 1974, continuing the downward trend begun in 1964. Coal mine employment also decreased, falling to 202.8 million persons, or 3.6% below that of 1973. Output per man-shift fell by 2.1% to 3,275 kilograms.

Under the new energy program, production of coal is to be maintained at 94 million tons per year up to 1980, as compared with the goal in the 1973 program of 83 million tons in 1978. Sales are expected to account for less than 90 million tons per year; the balance of production is to go into a reserve provided for possible future energy shortages. A reserve of 10 million tons, to be financed from public funds, will be established.

Stocks of coal declined from 19 million tons in September 1973 to 4.8 million tons at the end of September 1974. These stocks were used to supply the energy needs of the EC as well as West Germany during the oil crisis. Under the revised program, sales of coal to the electric power industry are to be set at an average of 33 million tons annually, as compared with the 1973 plan, which provided for 30 million tons annually.

Requirements for coking coal for the steel industry are estimated to be 25 million tons to 1980, of which 22 million tons will be supplied by domestic production and 3 million tons will be imported. Importation of coking coal has heretofore been prohibited. Subsidies will continue on domestic coking coal.

Imports of coal during 1974 totaled 5.8 million tons, a decrease of 1.2 million tons or 16.9% less than the 7.0 million tons imported during 1973. Imports of coal from other EC nations during 1974 were less than half of those of 1973, falling from 3.1 million to 1.5 million tons. Poland remained the major source of imported coal, increasing the amount supplied in 1974 by 7.8% to 1.9 million tons, or 33.1% of the total imported during 1974. The United States was the second largest supplier of coal to West Germany, shipping 1.4 million tons, or 24.5% of total imports, and 7.6% over the amount shipped in 1973.

Coke imports totaled 1.3 million tons in 1974, slightly more than in 1973.

Coal exports during 1974 were 17.4 million tons, an increase of 3.6 million tons, or 25.9% above 1973 exports. Exports to EC countries increased 19.9% to 15.9 million tons in 1974, compared with 13.3 million tons in 1973. Most of the coal exported, 91.4%, went to other EC nations.

Exports of coke in 1974 totaled 13.1 million tons, an increase of 2.8 million tons, or 27.5% more than the 10.3 million

tons exported during 1973. The principal market for coke exports was the other EC nations, which received 63.1% of the total in 1974, compared with 71.2% in 1973.

The firm of Ruhrkohle AG (RAG), which was formed in 1968 through the consolidation of 26 coal mining companies, made much progress in recovering from the poor financial condition it had been in since its founding. The firm, which produces three-fourths of West Germany's coal, lost about $570 million between 1968 and 1973 but sustained no further losses in 1974. The improved financial condition of RAG was brought about primarily as a result of the better competitive position of West German coal resulting from the international energy crisis together with a strong worldwide demand for metallurgical coal.

RAG has also constructed a coal gasification and liquefaction research center in the Ruhr area and is planning to join Gulf Energy and Mineral Corp. in a coal oil pilot project in the State of Washington. The company has also acquired Appalachian Resources Co. of Oak Hill, West Virginia, which operates five coal mines in West Virginia and Kentucky. The latter is expected to export about 500,000 tons of coal to West Germany in 1975.

Production of lignite in West Germany in 1974 amounted to 126 million tons, 6% above 1973 production. The firm of Rheinische Braunkohlenwerke AG (Rheinbraun) of Cologne produced 86.5% of this total, or 109 million tons. In 1974 about 67,000 million kilowatt-hours of electricty were generated from Rheinbraun lignite, 10.5% more than in 1973. Lignite briquet production fell to approximately 6.3 million tons, a decrease of 2.5% over 1973. In 1974, lignite accounted for 21% of primary energy production and 37% of all public electricity generation. It is planned to increase lignite-fired power station capacity from the present 11,800 megawatts to 14,000 megawatts by 1976. New open pit mines are planned, and extensive research is being conducted on production of gas from lignite.

Imports of lignite increased to 1.3 million tons in 1974 from 1.2 million tons in 1973.

**Table 10.—Federal Republic of Germany: Coal and lignite industry**
(Production, productivity, and employment)

| | | 1972 | 1973 | 1974 |
|---|---|---|---|---|
| BITUMINOUS AND ANTHRACITE | | | | |
| Production:[1] | | | | |
| Ruhr | million tons | 83.3 | 79.9 | 78.2 |
| Saar | do | 10.4 | 9.2 | 8.9 |
| Aachen | do | 6.2 | 6.0 | 5.8 |
| Lower Saxony | do | 2.5 | 2.3 | 1.9 |
| Total[2] | do | 102.5 | r 97.3 | 94.9 |
| Output per man-shift: | | | | |
| Ruhr: | | | | |
| Underground | kilograms | 4,081 | 4,126 | 3,986 |
| Total mining | do | 3,401 | 3,433 | 3,363 |
| Federal Republic average: | | | | |
| Underground | do | 4,015 | 4,068 | 3,937 |
| Total mining | do | 3,308 | 3,346 | 3,275 |
| Employment: | | | | |
| Ruhr: | | | | |
| Underground | thousand persons | 100.4 | 91.3 | 88.0 |
| Mine surface | do | 21.0 | 19.9 | 18.9 |
| Cleaning | do | 11.2 | 10.0 | 10.0 |
| Total, including other workers and salaried employees | do | 182.7 | 167.2 | 160.9 |
| Federal Republic total: | | | | |
| Underground | do | 125.5 | 113.7 | 109.3 |
| Mine surface | do | 27.8 | 26.2 | 25.1 |
| Cleaning | do | 14.1 | 12.9 | 12.8 |
| Total, including other workers and salaried employees | do | 229.7 | 210.3 | 202.8 |
| LIGNITE AND SUBBITUMINOUS | | | | |
| Production: | | | | |
| Rhineland | million tons | 95.7 | 101.7 | 109.5 |
| Helmstedt, Hesse, Bavaria | do | 14.7 | 16.9 | 16.5 |
| Total | do | 110.4 | r 2 118.7 | 126.0 |

See footnotes at end of table.

Table 10.—Federal Republic of Germany: Coal and lignite industry—Continued
(Production, productivity, and employment)

| | | 1972 | 1973 | 1974 |
|---|---|---|---|---|
| LIGNITE AND SUBBITUMINOUS—Continued | | | | |
| Employment: | | | | |
| Rhineland | thousand persons | r 15.3 | r 14.7 | 14.6 |
| Helmstedt, Hesse, Bavaria | do | r 6.0 | r 5.7 | 5.5 |
| Total | do | r 2 21.2 | r 20.4 | 20.1 |

r Revised.
1 Excludes small mines and leases.
2 Data may not add to totals shown because of independent rounding.

Source: Statistik der Kohlenwirtschaft, e.V. Zahlen zur Kohlenwirtschaft, No. 102, March 1975.

**Petroleum and Natural Gas.**—As a result of depletion of domestic deposits, crude oil production continued to decline, decreasing 6% below the 1973 amount to 6.2 million tons. Refining capacity increased from 139.5 million to 147 million tons per year, but utilization of capacity fell from 83.4% to 72.9% in 1974. Refinery throughput decreased by 8% from 116.5 million tons in 1973 to 107.3 million tons in 1974.

Domestic consumption of petroleum products decreased 10.5% to 120.4 million tons from 134.6 million tons in 1973. Crude oil imports decreased 7.2% from 110.5 million tons in 1973 to 102.5 million tons in 1974. Saudi Arabia was the largest supplier with 24.4%, followed by Libya with 16.3% and Iran with 13.0%. Of the total, 56.0% originated in the Middle East, 39.0% in Africa, 3.0% in the U.S.S.R., and 2.0% in Latin America. The distribution of imports of crude oil by country of origin, in thousand tons follow:

| Country | 1973 | 1974 |
|---|---|---|
| Saudi Arabia | 25,283 | 25,080 |
| Libya | 25,649 | 16,719 |
| Iran | 14,122 | 13,352 |
| Nigeria | 10,249 | 11,514 |
| Algeria | 13,557 | 9,685 |
| Abu Dhabi | 5,304 | 6,436 |
| Kuwait | 4,286 | 4,261 |
| Iraq | 1,613 | 3,571 |
| U.S.S.R. | 2,735 | 3,018 |
| Dubai | 2,588 | 2,380 |
| Venezuela | 2,162 | 2,236 |
| Qatar | 726 | 1,076 |
| Gabon | 936 | 959 |
| Syria | 533 | 945 |
| Tunisia | 119 | 691 |
| Angola | -- | 294 |
| Norway | 366 | 142 |
| Egypt | 204 | 99 |
| Other | 59 | 83 |
| Total 1 | 110,493 | 102,543 |

1 Data may not add to totals shown because of independent rounding.

Source: Bundesamt für Gewerbliche Wirtschaft, Hamburg, Mineralölstatistik der Bundesrepublik Deutschland.

At the end of the year, stocks of crude oil were 10.1 million tons, 29.4% above those of 1973; stocks of gasoline, 2.2 million tons; stocks of middle distillates, 11.2 million tons; and stocks of heavy fuel oil 3.6 million tons. West German refinery output of finished products was for 1973-74 in thousand tons follow:

| | 1973 | 1974 |
|---|---|---|
| Refinery, heating, and town gas | 4,488 | 4,096 |
| Ethylene, propylene, butadiene, butylene | 1,444 | 1,700 |
| Other LPG | 1,890 | 1,737 |
| Motor gasoline (including aviation) | 14,582 | 13,581 |
| Naphtha and spirit | 5,641 | 5,605 |
| Kerosine and jet fuel | 1,250 | 1,094 |
| Diesel oil | 10,717 | 9,756 |
| Fuel oil, light [1] | 32,386 | 29,621 |
| Lubricating oil, grease | 949 | 970 |
| Fuel oil, heavy | 34,702 | 30,889 |
| Paraffin, wax | 134 | 132 |
| Bitumen | 4,550 | 4,366 |
| Petroleum coke | 779 | 766 |
| Sulfur | 98 | 102 |
| Other products | 1,552 | 1,494 |
| Total | 115,162 | 105,909 |

[1] Includes refineries' own consumption.

Plans for the merger of West Germany's two largest oil firms continued with the offer of Vereinigte Elektrizitäts und Bergwerks AG (Veba) to exchange shares of Veba stock for the 48.7% of publicly held stock in Gelsenberg AG. The West German Government holds 40% of Veba stock and a 51.3% interest in Gelsenberg. The combined company will be the largest in West Germany. Formation of the company was an important part of the West German energy program and is designed to create a company better able to compete internationally as well as in the home market in which non-German interests have an estimated 75% share.

The West German oil exploration firm, Deutsche Erdölversorgungsgesellschaft mbH (Deminex), had participation and exploration agreements covering 270,000 square kilometers, of which about 40% was offshore. The area included exploration projects in the British section of the North Sea, the Gulf of Suez, the coast of Trinidad and Tobago, and off the coasts of Guyana, Nigeria, Burma, and Indonesia. Most of the projects are in the form of consortia with international partners. A total of 20 exploration wells have been drilled with the greatest number off the coast of Nigeria. Gas has been discovered off the coasts of Nigeria and Trinidad and Tobago but has not yet been proved to be present in commercial amounts.

Deutsche Shell A.G. acquired three concessions off the west coast of Portugal in a joint effort with a Portuguese firm, and also acquired exploration concessions from the Government of Yemen in the Red Sea. Activity was resumed in the German area of the North Sea with the sinking of two new wells, one of which yielded natural gas but which has not yet been determined to be commercial.

Onshore drilling activities were expanded during the year, and a total of 160,000 meters were drilled, yielding new natural gas finds. A new natural gas region near Uelzen, Lower Saxony, will be exploited in 1975–76 with an annual production of 800 million cubic meters. A pipeline network will be built to supply the Hanover-Brunswick area with natural gas from Uelzen.

A new refinery is under construction by Mobil at Wilhelmshaven, which will come onstream in 1975 with a capacity of 160,000 barrels per day.

Approval was given for expansion of the Elf Mineralöl GmbH's refinery at Speyer, Rhineland-Palatinate, and Fina-Total's refinery at Duisberg. Veba officially postponed construction of their new refinery at Orsoy, North Rhine-Westphalia, and Shell postponed its refinery expansion at Ingolstadt, Bavaria.

Production of natural gas increased 5.8% from 18.9 billion cubic meters in 1973 to 20.0 billion cubic meters in 1974. The principal source of the increased domestic gas output continued to be the Schlochteren Field in the Ems estuary. West German gas production from this source amounted to 4,100 million cubic meters, or 36% more than in 1973. In 1974, natural gas consumption increased to 40,800 million cubic meters, of which 20,500 million cubic meters were imported from the Netherlands and the Soviet Union. Future supplies of natural gas are projected from the Norwegian Ekofisk Field in the North Sea through a pipeline to Emden and from

Iran via a pipeline through the Soviet Union. In August 1974, another contract was concluded with the Soviet Union providing for the delivery of an additional 2.5 billion cubic meters annually to be delivered to West Germany by 1980.

Negotiations with Algeria for liquefied natural gas to be supplied beginning in 1978 were temporarily discontinued. Ruhrgas AG completed a 300-mile section of a natural gas pipeline between Aachen near the Netherlands border and Rheinfelden near the northern border of Switzerland.

In addition to renewed drilling activity in the North Sea area, exploratory drilling in Miesbach, Bavaria, and Velpke/Asse, Lower Saxony, has been initiated.

**Table 11.—Federal Republic of Germany: Petroleum and natural gas production by area**

| Area | 1973 | 1974 |
|---|---|---|
| | Petroleum (thousand tons) | |
| Schleswig-Holstein | 653 | 548 |
| Hanover | 1,851 | 1,702 |
| Weser-Ems | 1,787 | 1,739 |
| Emsland | 1,821 | 1,717 |
| Upper Rhine Valley | 172 | 149 |
| Alpine foothills | 354 | 336 |
| Total | 6,638 | 6,191 |
| | Natural gas (million cubic meters) | |
| Hanover | 114 | 105 |
| Weser-Ems | 12,240 | 12,790 |
| Ems Estuary | 3,040 | 4,138 |
| Emsland | 1,788 | 1,773 |
| Upper Rhine Valley | 14 | 9 |
| Alpine foothills | 1,658 | 917 |
| Total | 18,854 | 19,732 |

Source: The Petroleum Publishing Co. International Petroleum Encyclopedia, Tulsa, Oklahoma, 1975, 480 pp.

**Table 12.—Federal Republic of Germany: Shipments of petroleum products**
(Thousand metric tons)

| | 1972 | 1973 | 1974 |
|---|---|---|---|
| Domestic sales: | | | |
| Gasoline, all kinds | 23,107 | 24,472 | 23,301 |
| Kerosine, including jet fuel | 2,057 | 2,045 | 2,131 |
| Diesel oil | 10,151 | 10,798 | 9,955 |
| Fuel oils | 76,654 | 81,669 | 69,584 |
| Liquefied petroleum gas | 2,605 | 3,052 | 3,143 |
| Lube oil and greases | 1,078 | 1,162 | 1,045 |
| Petroleum coke | 1,692 | 1,902 | 1,833 |
| Bitumen | 4,896 | 4,656 | 4,648 |
| Refinery gas | 1,866 | 1,800 | 2,019 |
| Other products | 1,933 | 3,079 | 2,722 |
| Total | 126,039 | [1] 134,637 | 120,381 |
| Consumption by refineries: | | | |
| Fuel oil | 4,115 | 4,335 | 4,423 |
| Refinery gas | 3,513 | 3,727 | 3,542 |
| Petroleum coke | 239 | 264 | 258 |
| Total | 7,867 | [r 1] 8,327 | 8,223 |
| Bunker deliveries: | | | |
| Diesel oil | 829 | 738 | 546 |
| Fuel oil | 3,122 | 2,902 | 2,491 |
| Lubricants | 49 | 55 | 48 |
| Total | 4,000 | 3,695 | 3,085 |
| Exports | 7,775 | 8,835 | 9,321 |
| Other shipments | 2,372 | 2,009 | 1,853 |
| Changes in refinery stock | +191 | +1,382 | +905 |
| Balancing factor [2] | −10 | −67 | -- |
| Total products available | 148,234 | [r] 158,818 | 143,768 |

[r] Revised.
[1] Data may not add to totals shown because of independent rounding.
[2] Apparently changes in nonrefinery stocks.

Source: Mineralölstatistik der Bundesrepublik Deutschland. Bundesamt für Gewerbliche Wirtschaft, Hamburg, 1974.

# The Mineral Industry of Ghana

By Janice L. W. Jolly [1]

The 1974 mineral output of Ghana consisted primarily of bauxite, gold, diamond, manganese, cement, and salt, and refined petroleum. Although the world diamond market took a downturn, Ghana's diamond production increased over that of 1973 mainly because of increased production by independent licensed diggers. Overall gold production was down by 22%, but the high price of gold on the free market allowed continued mine expansion aimed at increasing lower grade ore tonnage. Manganese production also dropped by 21% in 1974 as compared with 1973. The Nsuta manganese mine, at one time considered one of the largest manganese mines in the world, was reported as having only a short life left. Ghana joined the International Bauxite Association (IBA) and participated in the higher bauxite levies that were setup by the IBA in 1974.

The cumulative trade surplus during the first 6 months of 1974 fell by 73% compared with that during the same period in 1973. By December 1974, the balance of payments reportedly showed a deficit of $19.4 million.[2] Reported causes for the deficit were: A sharp reduction in world prices for some of Ghana's principal export items such as timber; a quadrupling of imported crude oil prices; and inflated prices for imported fertilizers and capital equipment. Oil imports accounted for about one-third of Ghana's import bill. To combat excessive imports, subsidies were removed from certain food items once considered essential but now considered as foreign food. Increases in wages and government salaries occurred simultaneously to counter inflation. All unutilized import licenses were cut in half for the last half of 1974, which was looked upon as a step to conserve foreign exchange.

Increased attention was given to further geological surveys and the exploitation of Ghana's mineral wealth such as the Kibi and Nyinahin bauxite deposits. A new fund, under the control of the Commissioner for Land and Minerals Resources, was set up in 1974 for mineral exploration and development. The fund is to be financed out of a levy on gold exports imposed on mining companies, including the state-owned Gold Mining Corporation (GMC). In the year 1973/74, exports of gold attracted a special levy. Each exporter of gold, for the first 100,000 troy ounces, was exempt from the levy, but for every ounce beyond this, a levy of $2.78 was charged.[3] Record setting revenues were derived from mineral duties, royalty payments, and levies and taxes from gold mining ventures in 1974.

The 1974–75 budget was presented on August 23, 1974, and was aimed at an expenditure of $481.9 million. Most items were increased. Development projects were allocated $214 million. Several sources of revenue were being increased including income tax. GMC was allotted $1.22 million in the 1974–75 budget for importing new equipment and exploratory activities.

The United States agreed to a long-term $19 million loan to finance the cost of machinery, equipment, and other priority items for various development projects. The loan is to be repaid in 40 years, including a 10-year moratorium. Interest is 3% for 30 years and 2% during the 10-year moratorium period. The International Development Association (IDA)

[1] Physical scientist, Division of Ferrous Metals.
[2] Where necessary, values have been converted from the Ghana new cedi (N¢) to U.S. dollars at the rate of N¢1.00=US$0.87.
[3] Barclays International Review (London). Ghana. October 1973, p. 21.

issued a credit of $10.4 million towards a total $44.7 million needed for water supply projects around the Accra-Tema metropolitan area. The United Nations Development Program (UNDP) and the Ghana Government were to undertake a $3.5 million water supply and environmental health project to solve rural water and sanitation problems. Ghana also signed the first of four agreements with the UNDP under which the UNDP will assist the GMC in the exploration of new gold deposits. Investment in the program amounts to $3.9 million.[4] The UNDP will also undertake geological investigation of known gold-bearing areas in the Western Region located north of Prestea.

A fertilizer plant, estimated to cost about $870,000 was planned for either Tema or Takoradi. It would be a joint venture of the Ministry of Agriculture, the National Investment Bank, the Agricultural Development Bank, and a foreign company. Initially it will be fed with imported raw materials until the extent of the phosphatic deposits located near the Ghana-Togo border has been determined.[5]

Canada was reportedly investing $3 million in a hydraulic project as a joint venture with Ghana. Canadian consultants were conducting feasibility studies for construction of a dam at Kpong, about 10 miles downstream from the Akosombo dam, and were expected to complete the study in December 1974. The Volta River Authority also intends to reactivate the Bui Dam project. Estimated construction costs for Kpong and Bui are $89.3 million and $146.1 million, respectively. Installed capacity at Kpong is expected to be 200 megawatts, and at Bui, 300 megawatts, and would satisfy Ghana's electrical needs through 1995. The capacity of the Akosombo plant is 912 megawatts of electricity.

Bulgaria is to provide doctors and geologists to work in Ghana under an agreement for scientific, technical, and cultural cooperation in irrigation, geological survey, animal husbandry, and construction of an Olympic sports complex. Other possible joint projects with Bulgaria included the production of caustic soda and fertilizers. Poland and Ghana also signed a new trade agreement, superseding the 1967 agreement. Agricultural items, manganese, bauxite and alumina, and diamonds will be exported to Poland. The German Democratic Republic was expected to increase trade with Ghana. They hoped to import crops worth an estimated $5 million in 1974. Romania also has a bilateral trade agreement with Ghana. The second economic and trade exhibition of the People's Republic of China (PRC) was held in Ghana. The first was held in 1961.

The steelworks division of Ghana Industrial Holding Corp. at Tema was to start large-scale production of spare parts for various types of vehicles and agricultural machinery. The Government has allotted about $2 million for expansion of the foundry to carry out the project. Rehabilitation of the plant and the foundry would help the division to produce about 30,000 tons of steel rods in an effort to meet the local demand.

## PRODUCTION AND TRADE

Mineral commodity production, excluding petroleum refinery products, was valued at an estimated $255 million in 1974 compared with an estimated $182 million in 1973. In 1974, 2.6 million carats of diamonds were produced, up 10.8% over 1973 production. Ghana Consolidated Diamonds Ltd. (GCDL), produced 2.4 million carats, or 93.6% of the total. Independent African miners produced 164,000 carats, up 215% from the 52,000 carats officially recorded in 1973. Ghana exports diamonds to the United Kingdom, the Netherlands, and Belgium-Luxembourg. The total gold produced for the first 6 months of 1974 was 316,923 troy ounces, and overall production for the year was down compared with that of 1973. The United States is Ghana's leading supplier of lube oils, and the U.S.S.R. and Nigeria have been chief sources of crude oil for the past few years. The Tema refinery has a 25,000-barrel-per-day capacity and is owned and operated by the Ghanaian Italian Petroleum Co. Ltd. (GHAIP). In March 1974, the sales tax on gasoline, fuel oil, diesel, and marine oil was abolished in an effort to minimize the effect of price increases. Aluminum ingots and billets produced by the Volta Aluminium Co. Ltd. (Valco) smelter at Tema were exported mainly to the United Kingdom and the United States.

[4] Metal Bulletin (London). No. 5972, Mar. 7, 1975, p. 24.

[5] Barclays International Review (London). Ghana. November 1973, p. 16.

## Table 1.—Ghana: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| **METALS** | | | | |
| Aluminum: | | | | |
| Bauxite, gross weight | | 340,321 | 309,908 | 363,129 |
| Metal, smelter production, primary | | 144,070 | 150,707 | 157,198 |
| Gold | thousand troy ounces | 724 | 723 | 567 |
| Manganese ore and concentrate, gross weight | | 498,340 | 318,211 | 250,253 |
| **NONMETALS** | | | | |
| Cement | thousand tons | [r] 412 | 436 | [e] 450 |
| Diamond: | | | | |
| Gem | thousand carats | 266 | 232 | 257 |
| Industrial | do | 2,393 | 2,085 | 2,316 |
| Total | do | 2,659 | 2,317 | 2,573 |
| Salt | | [e] 50,000 | 43,690 | 45,000 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | |
| Petroleum refinery products: | | | | |
| Gasoline | thousand 42-gallon barrels | 1,669 | 1,726 | 1,967 |
| Jet fuel | do | 279 | 199 | 318 |
| Kerosine | do | 689 | 735 | 743 |
| Distillate fuel oil | do | 1,919 | 1,956 | 2,382 |
| Residual fuel oil | do | 2,459 | 2,309 | 2,606 |
| Other | do | 55 | 60 | 62 |
| Refinery fuel and losses | do | 385 | 351 | 418 |
| Total | | 7,455 | 7,336 | 8,496 |

[e] Estimate. [p] Preliminary. [r] Revised.

[1] In addition to the commodities listed, a variety of crude construction materials (clays, sand, gravel, and stone) is produced, but production data are not reported and available general information is inadequate for the formulation of reliable estimates of output levels.

## Table 2.—Ghana: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|---|
| **METALS** | | | | |
| Aluminum: | | | | |
| Bauxite and concentrate | | 316,232 | 312,229 | United Kingdom 193,938; Canada 47,618; Netherlands 42,984. |
| Metal including alloys, unwrought and semimanufactures | | 138,802 | 125,177 | Japan 34,437; United States 33,902; United Kingdom 15,227. |
| Gold bullion | thousand troy ounces | 737 | 722 | Switzerland 702. |
| Iron and steel, metal, semimanufactures | | 2,072 | 1,602 | Italy 1,016; Egypt 514. |
| Manganese, ore and concentrate | | 475,251 | 290,131 | Norway 99,708; Spain 52,991; United Kingdom 40,025. |
| Other nonferrous metal, scrap, n.e.s | | 2,728 | 1,797 | Belgium-Luxembourg 703; West Germany 564; Netherlands 526. |
| **NONMETALS** | | | | |
| Cement | | 415 | -- | |
| Diamond, all grades | thousand carats | 3,193 | 2,267 | United Kingdom 1,461; Netherlands 324; Belgium-Luxembourg 295. |
| Salt | | -- | 12 | All to Togo. |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | |
| Petroleum: | | | | |
| Crude and partly refined | thousand 42-gallon barrels | [r] 2 | 2 | All to United Kingdom. |
| Refinery products: | | | | |
| Gasoline | do | 39 | 2 | Mainly to United Kingdom. |
| Kerosine and jet fuel | do | 26 | 6 | Do. |
| Distillate fuel oil | do | 11 | (1) | All to Togo. |
| Residual fuel oil | do | 1,698 | 1,464 | United States 770; Greece 409; Italy 156. |
| Lubricants | do | (1) | (1) | All to United Kingdom. |
| Total | do | 1,774 | 1,472 | |

[r] Revised.

[1] Less than ½ unit.

## Table 3.—Ghana: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum: | | |
| Oxide and hydroxide | r 311,039 | 220,494 |
| Metal: | | |
| Unwrought | 141 | 105 |
| Semimanufactures | 2,045 | 4,227 |
| Copper metal including alloys, all forms | 725 | 752 |
| Iron and steel: | | |
| Ore | 13 | (1) |
| Metal: | | |
| Scrap | r (1) | 4,009 |
| Pig iron, ferroalloys and similar materials | 835 | 2,712 |
| Steel, primary forms | -- | 10 |
| Semimanufactures | r 20,644 | 146,455 |
| Lead metal including alloys, all forms | 475 | 304 |
| Nickel metal including alloys, all forms | 15 | 6 |
| Platinum-group metals including silver ... troy ounces | 1,664 | 17,393 |
| Tin metal including alloys, all forms ... long tons | 10 | 74 |
| Zinc metal including alloys, all forms | 484 | 870 |
| Other, n.e.s: | | |
| Ore and concentrate | 11 | 150 |
| Scrap | 2 | 235 |
| Metal, including alloys | 258 | 695 |
| Oxides, hydroxides and peroxides of metals, n.e.s | 272 | 1,068 |
| **NONMETALS** | | |
| Abrasives, natural: | | |
| Pumice, emery, natural corundum, etc | -- | 3 |
| Grinding and polishing wheels and stones | 335 | 742 |
| Asbestos | 1,494 | 4,008 |
| Cement: | | |
| Clinker | 347,189 | 447,770 |
| Portland | 5,877 | 10,078 |
| Chalk | r (1) | 11 |
| Clays and clay products (including refractory brick): | | |
| Clays, n.e.s | 152 | 338 |
| Products | 4,415 | 7,119 |
| Diatomite and other infusorial earth | r (1) | 6 |
| Fertilizer materials: | | |
| Crude | r 17 | 334 |
| Manufactured | 2,106 | 15,130 |
| Ammonia | 142 | 105 |
| Gypsum and plasters | 6,195 | 10,108 |
| Lime | 2,024 | 5,673 |
| Mica, worked | 8 | 11 |
| Salt and brine | 42 | 384 |
| Sodium and potassium compounds, caustic soda | 3,970 | 8,707 |
| Stone, sand and gravel: | | |
| Stone: | | |
| Dimension | 364 | 948 |
| Crushed and broken | -- | (1) |
| Sand (not metal bearing) | 114 | 40 |
| Sulfur: | | |
| Sulfur and unroasted iron pyrite | 43 | 317 |
| Sulfuric acid | 212 | 1,293 |
| Talc | 123 | 737 |
| Other, crude[2] | 1,555 | 394 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Asphalt, natural | 25 | 67 |
| Coal and coke, including briquets | 303 | 18,248 |
| Hydrogen, helium and rare gases | 33 | 75 |
| Petroleum: | | |
| Crude and partly refined ... thousand 42-gallon barrels | 8,971 | 6,434 |
| Refinery products: | | |
| Gasoline ... do | 1 | 1,983 |
| Kerosine and jet fuel ... do | 3 | 7 |
| Distillate fuel oil ... do | -- | (1) |
| Lubricants ... do | r 116 | 151 |
| Other: | | |
| Mineral jelly and wax ... do | 14 | 184 |
| Unspecified ... do | r 418 | 690 |
| Total ... do | 552 | 3,015 |
| Mineral tar and other coal-, petroleum-, or gas derived crude chemicals | r 52 | 699 |

r Revised.
1 Less than ½ unit.
2 Includes mica, amber, meerschaum, jet and other unspecified nonmetals.

## COMMODITY REVIEW

### METALS

**Aluminum.**—A small semifabricating plant, Ghana Aluminium Products Ltd., located at Tema is owned 60% by Alcan Aluminium Ltd. of Canada and 40% by the Ghana Government. It is a sheet-rolling mill with corrugating equipment and a 9,000-ton-per-year capacity of sheet and strip, including corrugated roofing sheet. Ghana Pioneer Aluminium Co., Tema, produces hollowware and other fabricated products.

The Valco smelter started production in November 1966 and has a capacity of 150,000 tons. Valco obtains alumina outside Ghana at present, but under the terms of the 1961 Master Agreement, Valco is allowed to use imported alumina up to 1977, after which mild penalties may be applied if local bauxite is not utilized.[6] Kaiser Aluminum and Chemical Corp. of the United States, which owns 90% of Valco, planned a $60 million expansion to the smelter, raising the capacity to 192,000 tons. The contract was awarded to Kaiser Engineers. Valco was awarded the Overseas Private Investment Corp. (OPIC) Development Award in 1974 for its contribution and continued maintenance of services to Ghana since the company's beginning. Valco provides jobs for more than 2,000 Ghanaians.

A 10-man engineering team, lead by Mitsubishi Chemical Industries Ltd. of Japan, was undertaking a feasibility study to construct an aluminum smelter in the Volta River region. The planned smelter would be contingent on the possibility of developing sufficient new power sources, and the feasibility of mining the Kibi deposits.

The Ghana Government concluded an agreement on October 29, 1974, with the British Aluminium Co., Ltd. (BAC) under which a new company, owned 55% by the Government and called Ghana Bauxite Co. Ltd. (GBC), was formed. GBC will take over BAC operations at Ghana's only operating bauxite mine near Awaso. The mine has estimated reserves of 18 million tons of 50% and 14 million tons of 55% $Al_2O_3$.

The bauxite deposits of Kibi, with reserves of 88 million tons and a potential for 150 million tons with an average 45% bauxite and 2.95% silica, were still being investigated. The Bauxite Alumina Study Co. Ltd. (Bascol), was expected to finish the bauxite reserve evaluation in July 1975. An estimated $240 million is needed for development, including construction of railway lines and provision of water and electricity for the project. An annual production of 600,000 tons of alumina is planned when the project starts operation. Valco holds 50% and Ardeco (a consortium owned 70% by Japan's five primary aluminum producers and 30% by the Ghana Government) holds a 20% share of Bascol. The remaining 30% interest in Bascol dropped by Reynolds Metals Company in 1972 had reportedly not been taken up.[7] Bauxite deposits also occur at Nyinahin, where an estimated 200 million tons are proven with 50% bauxite and 3.1% silica with a further potential for 450 million tons.

**Gold.**—Gold from the Gold Coast was first recorded in 1471 when Portuguese traded gold dust at the mouth of the Pra River. Most of the ancient mining in Ghana was alluvial, but most modern mining is in lode deposits. Operating mines are located in the Ashanti region near Obuasi and Konongo, and in the Western region at Tarkwa, Prestea, Bogoso and Bibiani. Several smaller locations in various parts of Ghana[8] are no longer operated. Approximately 75% of the gold is presently extracted from gold-bearing quartz veins 20% from auriferous conglomerates, and 5% from alluvial gold deposits. The lode mines are of two types: (1) Quartz reefs (like the Ashanti Goldfields mine) occurring in steeply dipping Precambrian greenstones (Birrimian Series) and (2) the banket reefs (like the Tarkwa mines) occurring in an arenaceous rock (Tarkwaian Series) also of Precambrian age. The banket mines of Tarkwa are located mostly along the east limb of a geosyncline that trends about 150 miles northeast from the coast at Axim to Konongo. With the recent acquisition of 55% of the Ashanti Goldfields, all princi-

[6] Engineering and Mining Journal. Mining Activity Digest. Ghana. V. 1, No. 5, Oct. 7, 1974, p. 8.
[7] American Metal Market (New York). Japanese Study Ghana Smelter Plan. V. 81, No. 99, May 21, 1974, p. 8.
[8] Occurrences of Economic Minerals in Ghana. Geological Survey of Ghana, Accra, Ghana, Bull. No. 28, pp. 21–42, 1962.

pal gold-mining companies were controlled by the GMC.

With the average price of gold ranging between $195 and $116 per troy ounce on the London Metal Exchange in 1974, the Ghana Government earned record revenues and profits from its joint venture with Ashanti Goldfields. In the first 6 months of 1974, the Ghana Government earned more than $24 million with $4.8 million from dividends for its 55% share and over $19.6 million in mineral duties, royalties, levies, and taxes.[9]

Ashanti Goldfields reserves on June 30, 1973 were reported at 5.2 million tons with an average gold content of 0.69 troy ounces per ton. The Ashanti ore body is an irregular system of quartz veins with lenticular reefs in graphitic phyllite. The ore is either fine-grained free gold or associated with pyrite and arsenopyrite. The mine has seven shafts and had an operation depth of 3,609 feet in 1973. The cutoff grade was 8.5 grams per ton. An expansion program to include larger tonnages of lower grade ore was being continued in 1974. Tarkwa Goldfields mines reserves were reported at 475,000 tons averaging 0.37 troy ounces of gold per ton.

GMC was rehabilitating its mines at Tarkwa and Prestea in 1973 under a 4-year development program, including prospecting for new reserves. The Government allotted $1.2 million in the 1974–75 budget for exploration and equipment. GMC was to order two gold dredges incorporating the latest techniques for dredging both gold and diamonds in gravels for use in the Dunkwa area. Under a $3.9 million gold exploration program, the UNDP will investigate the region north of Prestea in western Ghana.

**Iron.**—In the past few years, there has been a renewed interest in the iron ore deposits of northern Ghana (discovered in 1928) and western Ghana (discovered in 1963). Feasibility studies were being done in the Opon-Mansi area by the West German company Friedr. Krupp Hüttenwerke AG. They will form a joint mining venture with the Ghana National Investment Bank if the deposits prove viable to mine. A six-man Bulgarian economic delegation will also evaluate iron ore at Shieni and Opon Mansi as part of the technical and scientific cooperation program to be undertaken in 1974–75. Establishment of an iron and steel complex in conjunction with development of Opon Mansi was also being considered.

The Shieni deposits near Yendi in the Northern Region consist of siliceous hematite covering about 32 square miles. Reserves are estimated at 270 million tons with iron content varying from about 29% to 53%. Silica is about 30%, sulfur 0.018%, and phosphorus 0.04%. The ores are reportedly amenable to gravity concentration to obtain an average 56.7% iron.[10] The Western Region deposits are lateritic and are estimated at 150 million tons with a potential for 205 million tons, are 10 to 90 feet thick, and cover the tops of hills in the Opon-Mansi area. Iron content is estimated at 41%, silica at 3%, alumina at 14%, and phosphate at 0.9%. A third deposit of titaniferous magnetite occurring at Pudo in the Upper Region is estimated at 4.5 million tons.

**Manganese.**—The Ghana Government assumed control of the Nsuta mine in a settlement reached with Union Carbide. The mine reportedly has only a short life left.

## NONMETALS

**Clays.**—A $35,000 brick factory at Asokwa was opened late in 1973 as an example of self-help from local materials by local labor giving employment to inhabitants of the surrounding area.

**Diamond.**—The two principal diamond mining areas, Birim River Basin (Eastern Region) and Bonsa River near Tarkwa (Western Region) have averaged a production of 2.7 million carats per year since 1960. Production has never again reached the peak production years of 3.2 million carats achieved through 1962, the last year of a free diamond market in Ghana. Since 1967, an average of 2.5 million carats have been produced. Although diamond production in 1974 increased over that of 1973, it still remained within the average of the past 7 years. The increase over 1973 was mainly due to a 215% increase in diamonds recovered by independent African miners, representing a difference between the 2 years of 112,000 carats. This may be an indication that steps taken towards containing smuggling have been somewhat successful.

[9] Barclays International Review (London). Ghana. July 1974, p. 17.
[10] Page 43 of work cited in footnote 8.

Cayco (Ghana) Ltd., GCDL, Dunkwa Goldfields, and about 60 licensed individual diggers were mining diamonds in 1974. Dunkwa Goldfields, principally a gold mining concern, obtains gem quality stones (2 to 4 carats) during dredging on the Jimi River in the Ashanti region. Gem-quality stones are also found in the Bonsa Valley, but are usually too small for commercial purposes. About 90% of the diamonds mined in Ghana are industrial grade. GCDL, in which the Government holds a controlling (55%) interest produced 93.6% of the total diamonds mined. The plant capacity will handle 2.5 million carats per year. Amalgamated Diamond Corporation ceased production late in 1973; and Cayco (Ghana) Ltd. production has decreased significantly since 1968. The company reportedly may soon be liquidated. Both concessions are located in the Birim Basin. A New York company, First International Natura Corp., with substantial American backing was negotiating for mining rights in a 24.56-square-mile area near the confluence of the Birim and Pra Rivers. The Government will take 55% of the project. Preliminary prospecting was completed.

The Diamond Marketing Corp. (DMC) grades, values, and processes diamonds as well as buys all those won locally. All companies except GCDL sell directly to DMC, and GCDL sells through DMC. Under a marketing arrangement started in 1968, licensed dealers must bid on "reserved prices" set by GCDL and the DMC. DMC sells diamonds abroad with assistance of Consolidated African Selection Trust Limited (CAST) in London.[11] CAST owns 45% of GCDL.

**Limestone and Granite.**—Chinese experts surveyed the Nauli limestone deposits, where there is an estimated 400 million tons of limestone in addition to 1,000 million tons in the Tano River Basin. The Nauli deposits may prove uneconomical to mine as they are covered by a thick overburden and are interbedded with sulfur-rich clays. Other deposits are located in Bonga-Da in the Upper Region and Buipe in the Northern Region. Reserves at Bonga-Da are estimated at 15 million tons of first quality limestone and 20 million tons of dolomitic limestone. The Buipe deposit contains an estimated 20 million tons first quality limestone, underlain by 100 million tons of dolomitic limestone. Both Bonga-Da and Buipe are at ground level.

The most important quarry for building stone is in the Shai Mountains where granite is mined. Another large quarry was opened at Takoradi for the construction of a naval base.[12]

## MINERAL FUELS

**Petroleum.**—In 1973, several groups including the Ashland Oil Co., Texaco Ghana Petroleum Co., Ltd., and Oceanic/West Coast Petroleum Co. relinquished a total of about 5,000 square miles of concession areas, mostly offshore. Mesa Petroleum Ltd. completed the onshore seismic survey started in 1972 and found noncommercial oil shows from Dzita 1 well in Block 24 in the Keta area onshore in May 1973. The well was abandoned on October 13, 1973, at 13,448 feet in the Devonian Takoradi Formation. Mesa Petroleum Ltd. includes Volta Petroleum Co. Ltd. and Kewanee Overseas Oil Co. Ltd. In April 1974, Mayflower Petroleum Corp. (United States) sold a 5% interest in the Keta concession to Mesa, Diamond Shamrock Oil Company Limited, and Hamilton Brothers Oil and Gas Ltd. in exchange for a commitment to drill two wells; and a 8% interest in the Keta concession to Hamilton for expenditures necessary to meet the original $6 million commitment. The three partners will have earned an additional 15.5% working interest in the area when all work requirements are completed. Zapata Exploration Co. operator for the Mobil Exploration Ghana, Ltd., group, established the noncommercial potential of the offshore Cape Three Points 1 well in Block 4 that was started in November 1973. The well was drilled to 13,823 feet,[13] in fulfillment of an agreement with Mobil, Zapata, and Phillips Petroleum Co. Both Zapata and Phillips were assigned interest (30% and 50%, respectively) in Mobil's offshore blocks 3, 3A, 4, and 5. More drilling was awaiting availability of another drill rig as the drillship *Glomar V* was under a one-well contract.

A consortium consisting of Amoco Ghana Exploration Co., Signal Oil and Gas Co., and Occidental Petroleum Corp. continued

[11] U.S. Embassy, Accra, Ghana. State Department Airgram, A-31, Apr. 18, 1975, 3 pp.
[12] Industries et Travaux D'Outre-Mer (Paris). Ghana. No. 249. (22d year). April 1974, p. 733.
[13] World Oil. Ghana. V. 179, No. 3, Aug. 15, 1974, p. 61.

prospecting in the Saltpond area. Shell Oil Co., which obtained concessions in the Volta Basin was soon to start exploration. Oil and gas exploration was among investments planned by the development group Durum Securities Corp. of New York and Sumitomo Shoji Kaisha, Ltd. (Japan). Fidesco (West Africa) Ltd., a new Ghanaian company, will cary out projects funded by the above consortium.

A new petroleum law was enacted in April 1974 that will allow all oil products distribution and storage facilities to be nationalized at will with compensation.

# The Mineral Industry of Greece

By Scott F. Sibley [1]

The economy of Greece reflected the strains of relatively high oil prices and political unrest in 1974. Economic stagnation, inflation, and balance of payment problems also contributed to the unfavorable economic situation. Real gross national product, for example, declined 2% from that of 1973, and prices climbed 13.5% compared with those of 1972.

The Consumer Price Index in 1974 exceeded that of 1973 by 27%, and the National Statistical Service wholesale price index increased 37% from 1973 to 1974. These increases were greater than those of 1973. Net private and official capital inflow increased slightly during the year. A major element of the capital account was $305 million borrowed by the Bank of Greece from foreign banks and the International Monetary Fund Oil Facility. Official assets in gold and convertible currencies declined by $112 million, and total postwar foreign indebtedness as of December 31, 1974, was estimated at $4.2 billion, 25% above the December 1973 level. The Greek Government's credit policy was designed to stimulate investment in manufacturing and exports and to aid the construction sector. However, improvements in this area were offset by Greece's perennial trade deficit, which was aggravated by relatively high petroleum prices and defense spending.

The Greek Government pursued a policy of closer relations with the European Communities (EC) during the year, and the Government expected that full integration with the EC might be achieved well in advance of the planned 1984 target date. On December 2, the Greek–EC Association Council held its first meeting since 1967, officially ending the freeze that had existed in Greek–EC relations.

Greece's new Mining Code included lignite, natural gas, sources of geothermal energy, and organic fertilizers as minerals for which the State alone has exploration and development rights. Gold and platinum were removed from this classification. In addition, acquisition of mineral research rights (directly or indirectly) or concessions, or the purchase of mineral property and shares by aliens, required prior approval of the Minister of Industry.

## PRODUCTION

Significant production gains in the Greek mineral industry were recorded in the following commodities: Lead mine output (24%); manganese crude ore (26%); nickel mine output (9%); zinc mine output (26%); barite crude ore (23%); bentonite (crude) (33%); magnesite (crude) (36%); magnesite (dead-burned) (40%); sulfur content of pyrite (16%); and pyrite (16%).

[1] Physical scientist, Division of Ferrous Metals.

## Table 1.—Greece: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite, gross weight ---- thousand tons | 2,408 | 2,748 | 3,004 |
| Alumina, gross weight ---- do | [r] 466 | 470 | 494 |
| Metal, primary | 131,277 | 143,269 | 148,000 |
| Antimony, mine output, metal content | 3 | 84 | 591 |
| Chromium, chromite: | | | |
| Crude ore, gross weight | 56,666 | 43,394 | 12,814 |
| Concentrates, gross weight | 22,130 | 18,462 | 9,589 |
| Copper, mine output, metal content | 1,556 | 1,440 | [e] 3,000 |
| Iron and steel: | | | |
| Iron ore and concentrate, gross weight | -- | 1,580 | -- |
| Pig iron and ferroalloys | 340,000 | 512,000 | 500,000 |
| Crude steel | [r] 605,310 | 753,323 | 612,320 |
| Steel semimanufactures [2] | 918,858 | 1,079,837 | NA |
| Lead: | | | |
| Mine output, metal content | 15,973 | 17,777 | 22,010 |
| Metal, refined: [3] | | | |
| Primary | 26,919 | 20,700 | 14,700 |
| Secondary | 17,330 | 17,857 | 14,350 |
| Manganese: | | | |
| Ore, crude, gross weight | 24,353 | 42,433 | 53,379 |
| Concentrate, gross weight | 5,305 | 6,222 | 7,920 |
| Nickel: | | | |
| Mine output, metal content [4] | 19,702 | 26,254 | 28,522 |
| Metal, content in alloys | [r] 11,269 | 13,946 | 15,059 |
| Silver, smelter or refinery production ---- thousand troy ounces | [r] 371 | 588 | 575 |
| Zinc, mine output, metal content | 17,718 | 19,462 | 24,510 |
| **NONMETALS** | | | |
| Abrasives, natural, emery | 7,000 | 7,000 | 7,000 |
| Asbestos | 2,825 | 30 | NA |
| Barite: | | | |
| Crude ore | 127,683 | 124,485 | 152,458 |
| Concentrate | 88,149 | 78,648 | 85,348 |
| Cement, hydraulic ---- thousand tons | [r] 6,281 | 6,494 | 7,024 |
| Clays: | | | |
| Bentonite: | | | |
| Crude | 375,413 | 472,229 | 626,779 |
| Processed | 17,595 | 15,603 | NA |
| Kaolin: | | | |
| Crude | 70,965 | 76,130 | [e] 77,000 |
| Processed | 11,977 | 12,194 | NA |
| Fertilizers, manufactured, gross weight: | | | |
| Nitrogenous ---- thousand tons | NA | 255 | 361 |
| Phosphatic ---- do | NA | 163 | 147 |
| Potassic ---- do | 5 | 16 | 30 |
| Fluorspar | 1,050 | [e] 1,100 | [e] 1,100 |
| Gypsum and anhydrite | [r] 361,351 | 420,360 | 420,000 |
| Magnesite: | | | |
| Crude | 931,658 | 1,068,326 | 1,453,291 |
| Dead-burned | 250,791 | 273,310 | 381,608 |
| Caustic calcined | 52,891 | 65,966 | 67,721 |
| Perlite: | | | |
| Crude | 123,816 | 247,948 | 209,591 |
| Screened | 109,091 | 125,712 | 114,195 |
| Pozzolan (santorin earth) | 657,262 | 723,665 | 820,735 |
| Pumice | 533,632 | 757,130 | 520,419 |
| Pyrite, gross weight | 403,235 | 430,000 | 500,000 |
| Salt, all types ---- thousand tons | 148 | [e] 150 | [e] 150 |
| Silica (probably) silica sand | 52,572 | 6,612 | 17,213 |
| Stone, marble ---- cubic meters | [r] 86,000 | 90,000 | 95,000 |
| Sulfur, content of pyrite | 181,456 | 194,000 | 225,000 |
| Talc | 5,441 | 5,251 | [e] 5,000 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Coal, lignite ---- thousand tons | [r] 11,586 | 13,118 | 13,931 |
| Coke: | | | |
| Coke oven ---- do | 269 | 400 | 372 |
| Gashouse ---- do | 13 | 10 | [e] 10 |
| Fuel briquets (lignite briquets) ---- do | 91 | 105 | 89 |
| Gas, manufactured: | | | |
| Gasworks ---- million cubic feet | 388 | 353 | 320 |
| Blast furnaces ---- do | 6,710 | 8,408 | 7,652 |
| Coke ovens ---- do | 5,121 | 7,239 | 6,811 |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels | 5,653 | 6,562 | 7,098 |
| Jet fuel ---- do | 2,688 | 3,632 | 2,384 |
| Kerosine ---- do | 1,225 | 930 | 302 |
| Distillate fuel oil ---- do | 14,562 | 23,641 | 22,111 |

See footnotes at end of table.

Table 1.—Greece: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Petroleum refinery products—Continued | | | | |
| Residual fuel oil | thousand 42-gallon barrels | 17,922 | 34,865 | 35,178 |
| Lubricants | do | 105 | 518 | 539 |
| Other | do | 4,431 | 6,510 | 9,250 |
| Refinery fuel and losses | do | 2,223 | 10,072 | 2,345 |
| Total | do | 48,809 | 86,730 | 79,207 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to the commodities listed, other types of crude construction materials such as clays, sand, gravel, and stone are produced, but output is unreported and available information is inadequate to make reliable estimates of output levels. Cobalt is also produced, but output is included with nickel.
[2] Black sheet, galvanized sheet, and reinforcing bars only.
[3] Includes antimonial lead and hard lead.
[4] Nickel plus cobalt contained.

## TRADE

Preliminary Bank of Greece data indicated that during January to November 1974 total exports increased 42.5%. Imports amounted to $4,144 during the same period, about 15% over those of this period in 1974. Higher petroleum prices were largely responsible for this increase. Invisible receipts were up 8.4%, with a 48.6% increase in shipping remittances. Emigrant remittances and tourist income declined 16% and 16.9%, respectively.

The current accounts deficit totaled $1,175 million, about 2% higher than for January–November 1973. Net capital inflow increased 13.9% to $1,136 million. This was largely attributed to the borrowing of $298 million, which included $43 million of Greece's $124 million International Monetary Fund Oil Facility credit.

The recent trends in mineral trade and total commodity trade may be observed from the following tabulation:

| | Value (million dollars) | |
|---|---|---|
| | Mineral commodity trade | Total commodity trade |
| Exports: | | |
| 1971 | 150.6 | 662.5 |
| 1972 | 193.1 | 870.9 |
| 1973 | 504.4 | 1,454.1 |
| Imports: | | |
| 1971 | 330.5 | 2,098.1 |
| 1972 | 449.3 | 2,345.8 |
| 1973 | 791.1 | 3,473.1 |

In 1973 principal increases in exports of selected mineral commodities (compared with those of 1972) occurred in crude nonmetallic materials (41%); petroleum and petroleum products (1760%); manufactured fertilizer (137%); iron and steel (184%); and nonferrous metallics (28%). However, these increases were more than offset by increases in imports of metallic ore and scrap (104%); petroleum (88%); solid fuels (41%); iron and steel (69%); and nonferrous metallics (74%).

The mineral commodity trade deficit increased from $256.2 million in 1972 to $286.8 million in 1973, a 12% increase, whereas the total commodity trade deficit increased from $1,475 million in 1972 to $2,019 million in 1973, a 37% increase.

## Table 2.—Greece: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite and concentrate thousand tons | 1,011 | 1,369 | Europe 740; U.S.S.R. 617. |
| Oxide and hydroxide | 237,665 | 162,494 | Netherlands 116,825; Romania 31,295; Italy 13,824. |
| Metal including alloys: | | | |
| Unwrought | 100,978 | 104,834 | France 42,523; Italy 29,683; Belgium-Luxembourg 22,016. |
| Semimanufactures | 7,228 | 11,619 | Italy 2,828; West Germany 2,550; Cyprus 723. |
| Chromium: | | | |
| Chromite | 17,850 | 16,600 | West Germany 11,200; Norway 5,400. |
| Copper: | | | |
| Metal including alloys: | | | |
| Scrap | 450 | 529 | All to Belgium-Luxembourg. |
| Unwrought and semimanufactures | 1,944 | 4,826 | France 1,222; West Germany 859; Iran 1,198. |
| Iron and steel: | | | |
| Roasted pyrite | 50,422 | 86,330 | West Germany 19,080. |
| Metal: | | | |
| Scrap | r 4,344 | 8,902 | NA. |
| Pig iron, ferroalloys, similar material | 22,182 | 142,592 | Sweden 50,136; West Germany 26,918; United States 17,210. |
| Steel, primary forms | 45,072 | 164,250 | Italy 83,762; Turkey 29,108; Iran 20,000. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 51,749 | 85,439 | United States 34,000; Israel 12,000; Netherlands 12,000. |
| Universals, plates, sheets | 62,064 | 156,275 | Yugoslavia 85,921; United States 42,106. |
| Hoop and strip | 2,813 | 9,181 | Yugoslavia 8,162; West Germany 976. |
| Wire | 348 | 5 | NA. |
| Tubes, pipes, fittings | 15,670 | 38,189 | Libya 17,164; Cyprus 6,596; Belgium-Luxembourg 3,076. |
| Lead, ore and concentrate | 12,050 | 16,000 | Italy 12,000; Belgium-Luxembourg 4,000. |
| Manganese, ore and concentrate | 8,009 | 8,363 | France 4,100; West Germany 3,840. |
| Silver, metal including alloys value thousands | $296,000 | $1,641 | All to France. |
| Zinc, ore and concentrate | 30,846 | 43,266 | Italy 22,654; Spain 6,000; Yugoslavia 3,112. |
| Other: | | | |
| Ore and concentrate of base metals n.e.s | 21,860 | 25,069 | West Germany 11,200; Norway 5,400. |
| Ash and residue containing nonferrous metals | 2,250 | 13,688 | Belgium-Luxembourg 906. |
| **NONMETALS** | | | |
| Abrasives, natural, n.e.s | 377,797 | 1,161 | United States 332; West Germany 214; Netherlands 214. |
| Barite and witherite | 79,352 | 69,043 | United States 46,582. |
| Cement | 801,753 | 348,948 | Libya 250,749; Algeria 75,472. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays n.e.s | r 198,163 | 317,427 | Canada 155,712; Nigeria 34,250. |
| Products | 19,690 | 13,313 | NA. |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous | 10,050 | 42,730 | People's Republic of China 21,947; Turkey 20,783. |
| Phosphate | 108,864 | 136,410 | Turkey 66,794; Cyprus 34,005; People's Republic of China 21,000. |
| Other | 16,995 | 92,883 | Turkey 39,829; Belgium-Luxembourg 15,400; United Kingdom 14,972. |
| Lime | 17,135 | 26,781 | All to Libya 26,632. |
| Magnesite | 304,007 | 370,838 | West Germany 138,517; United States 60,479. |
| Stone, sand and gravel | 40,250 | 49,829 | Italy 14,712; West Germany 9,579; Libya 5,249. |
| Sulfur: | | | |
| Elemental, other than colloidal | r 2,274 | 22,000 | Mainly to Turkey. |
| Sulfuric acid | 49,989 | 66,330 | Italy 56,168; Israel 9,322. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 226,555 | 261,727 | West Germany 64,010; France 48,495; United Kingdom 34,298. |
| Slag, dross, similar waste, not metal bearing | 7,281 | 10,375 | Republic of South Africa 600. |
| Building material of asphalt, asbestos and fiber, cement, unfired nonmetals, n.e.s | 22,122 | 32,740 | France 11,396; Libya 7,871; Israel 3,162. |

See footnotes at end of table.

## Table 2.—Greece: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Petroleum: | | | |
| Refinery products: | | | |
| Gasoline | | | |
| thousand 42-gallon barrels | 45 | 7,043 | United Kingdom 4,190; Netherlands 1,030. |
| Kerosine ---- do ---- | 2,143 | 2,198 | Syria 270; United States 240. |
| Distillate fuel oil ---- do ---- | 262 | 7,042 | West Germany 1,442; Netherlands 1,223; Italy 786. |
| Residual fuel oil ---- do ---- | 424 | 1,235 | Italy 407; Sweden 84. |
| Lubricants ---- do ---- | 18 | 235 | United Kingdom 62; United States 57; West Germany 24. |
| Other, paraffin ---- do ---- | 3 | 1 | NA. |

r Revised. NA Not available.

## Table 3.—Greece: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum: | | |
| Oxide and hydroxide | 590 | 433 |
| Metal including alloys: | | |
| Scrap | 709 | -- |
| Unwrought | 2,943 | 1,684 |
| Semimanufactures | 2,450 | 2,298 |
| Antimony metal including alloys, all forms | 22 | 14 |
| Chromium oxide and hydroxide | r 161 | 160 |
| Copper: | | |
| Metal including alloys: | | |
| Scrap | 388 | 56 |
| Unwrought | 15,629 | 18,490 |
| Semimanufactures | 1,078 | 1,246 |
| Copper sulfate | 1,607 | 921 |
| Iron and steel: | | |
| Ore and concentrate | 426,771 | 855,938 |
| Metal: | | |
| Scrap | 96,404 | 148,680 |
| Pig iron including cast iron | 17,637 | 24,416 |
| Sponge iron, powder and shot | 486 | 765 |
| Ferroalloys | 6,085 | 7,397 |
| Steel, primary forms | 174,525 | 338,272 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections | 235,286 | 550,032 |
| Universals, plates, sheets | 142,921 | 353,641 |
| Hoop and strip | 62,283 | 59,203 |
| Rails and accessories | 34,275 | 6,328 |
| Wire | 14,561 | 19,053 |
| Tubes, pipes, fittings | 25,022 | 61,477 |
| Castings and forgings, rough | 2,088 | 4,595 |
| Lead: | | |
| Ore and concentrate | 20,309 | 16,007 |
| Metals including alloys: | | |
| Unwrought | 19,458 | 18,820 |
| Semimanufactures | 133 | -- |
| Magnesium metal including alloys, all forms | r 1,078 | 268 |
| Manganese ore and concentrate | 26,767 | 2,394 |
| Nickel metal including alloys, all forms | 248 | 403 |
| Platinum-group metals and silver, including alloys: | | |
| Platinum group ---- value, thousands | $112 | $395 |
| Silver ---- do ---- | $2,075 | $6,922 |
| Tin metal including alloys, all forms ---- long tons | 281 | 802 |
| Titanium oxides | 4,736 | 6,147 |
| Tungsten metal including alloys, all forms | 11 | 10 |
| Zinc: | | |
| Oxide | 547 | 572 |
| Metal including alloys: | | |
| Unwrought | 11,731 | 14,705 |
| Semimanufactures | 147 | 151 |
| Other: | | |
| Ores and concentrates of nonferrous base metals, n.e.s | 513 | 1,302 |
| Oxides, hydroxides, and peroxides of metals, n.e.s | 78 | -- |
| Metals including alloys, all forms: | | |
| Metalloids | r 165 | 270 |
| Alkali, alkaline, rare-earth metals | 5,269 | 5,489 |
| Base metals including alloys, all forms, n.e.s | 335 | 51 |

See footnotes at end of table.

## Table 3.—Greece: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| **NONMETALS** | | | |
| Abrasives, natural n.e.s.: | | | |
| Dust and powder of precious and semiprecious stones | value, thousands | $492 | $1,571 |
| Grinding and polishing wheels and stones | | 501 | 523 |
| Asbestos | | 8,929 | 14,339 |
| Boron materials, crude natural borates | | 1,106 | 798 |
| Cement | | 1,034 | 2,051 |
| Clays and clay products, including all refractory bricks: | | | |
| Crude clays, n.e.s | | 72,333 | 94,900 |
| Products: | | | |
| Refractory, including nonclay bricks | | 22,547 | 27,923 |
| Nonrefractory | | 3,697 | 5,736 |
| Feldspar and fluorspar | | 6,372 | 5,330 |
| Fertilizer materials: | | | |
| Crude: | | | |
| Phosphatic | | 261,967 | 413,066 |
| Other | | 8,694 | 414,057 |
| Manufactured: | | | |
| Nitrogenous | | 81,063 | 33,247 |
| Potassic | | 24,017 | 27,049 |
| Other, including mixed | | 1,875 | 2,512 |
| Ammonia | | 17,956 | NA |
| Graphite, natural | | 292 | -- |
| Gypsum and plasters | | 1,470 | 1,511 |
| Magnesite | | r 1,076 | 2,327 |
| Pigments, mineral, (including processed iron oxides) | | 1,615 | 1,690 |
| Precious and semiprecious stones, except diamond | value, thousands | $153 | $469 |
| Pyrite (gross weight) | | 130,830 | 147,680 |
| Salt | | 45,481 | 61,393 |
| Sodium and potassium compounds n.e.s | | 40,792 | 34,614 |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | | 593 | NA |
| Worked | | 953 | 222 |
| Dolomite, chiefly refractory grade | | 2,355 | NA |
| Sand, excluding metal bearing | | 71,273 | 84,259 |
| Sulfur: | | | |
| Elemental, all forms | | 88,329 | 137,473 |
| Sulfuric acid, oleum | | 5,742 | 4,385 |
| Talc, steatite, soapstone, pyrophyllite | | 2,588 | 3,259 |
| Other nonmetals, n.e.s.: | | | |
| Building materials of asphalt, asbestos, fiber cement, and unfired nonmetals, n.e.s | | 1,302 | 940 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Carbon black | | 2,018 | 2,644 |
| Coal and briquets: | | | |
| Anthracite and bituminous coal | | 465,754 | 650,600 |
| Briquets of coal | | 3,305 | 348 |
| Coke and semicoke | | 62,117 | 44,906 |
| Hydrogen, rare gases, hydrocarbons | | 181 | 55,322 |
| Petroleum: | | | |
| Crude and partly refined | thousand 42-gallon barrels | 50,802 | 12,321 |
| Refinery products: | | | |
| Gasoline (including natural) | do | 1,700 | 1,417 |
| Kerosine and jet fuel | do | 1,138 | 1,497 |
| Distillate fuel oil | do | 4,017 | 2,891 |
| Residual fuel oil | do | 8,012 | 2,984 |
| Lubricants | do | 649 | 650 |
| Mineral jelly and wax | do | 5 | 7 |
| Other: | | | |
| Bitumen and other residue | do | 245 | 493 |
| Bituminous mixtures, n.e.s | do | 2 | -- |
| Liquefied petroleum gas | do | 298 | 306 |
| Nonlubricating oils, n.e.s | do | 6 | 3 |
| Pitch and petroleum coke | do | 330 | 325 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | 7,971 | 19,066 |

r Revised. NA Not available.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Production of alumina and aluminum was 494,000 tons and 148,000 tons, respectively, during the year. The refining of large amounts of bauxite ore in Greece considerably improved Greece's foreign exchange earnings from exports of the refined metal. This totaled about $100 million in 1974 for both alumina and aluminum exports.

The Mining Company of Greece, established jointly by the Bodossakis Group and Aluminium de Grèce S.A. (ADG), planned a significant exploration project which was to be funded by loans totaling $200,000 to $300,000 from the French company Péchiney Ugine Kuhlmann (PUK). ADG also planned an aluminum smelter expansion costing $8.2 million and already had underway an $8.2 million investment program to control air pollution and to improve general plant production facilities at Distomon. Included in the air pollution program was the collection of electrolysis emissions at the plant and alumina dust at the shiploading ports. In March, an agreement was reached between the Government of Greece and representatives of Péchiney on electric power rates. An agreement for a 30% increase in the contractual price of electricity sold to ADG by the Public Power Corporation (PPC) was reached.

Negotiations between the Greek Government and Aluminum Company of America (Alcoa) were deadlocked at yearend over the proposed $350 million aluminum complex to be built at Megara. The principal obstacle again was the price of electricity to be supplied by the PPC. The Greek Government appeared to be moving at yearend toward an accommodation, but no breakthrough had been announced and the PPC remained adamant on the issue of power cost.

Officials of Voxitai Elikonos S.A., were considering the construction of an alumina plant in which the National Bank of Greece and PPC would participate. Mention was also made of possible cooperation with the Soviet Union. The Voxitai Elikonos bauxite concession reportedly contained between 210 and 313 grams of gallium per ton of ore.

In February, Eleusis Bauxite Mines, Inc., of the Skalistiri Mining Group began operating a bauxite dressing plant at Loutsa, Eleusis, for the exploitation of large but low-grade bauxite deposits with a silica content over 5%. The plant's output of 250,000 tons per year of dressed ore was scheduled for export to eastern and western European countries. In addition, Eleusis Bauxite constructed a bauxite sorting and classifying plant at Agia Marina in Stylis, near Lamia, to process material from its Oiti Mountain ore deposits.

Bauxites Parnasse Mining Co., the leading producer of bauxite in Greece, planned to raise production from 2 million to 3 million tons of bauxite per year. Investment plans were aimed at increasing the company's export potential between 1975 and 1980. The plans included a 35-ton-per-hour bauxite washing facility located at Viniani, Fokis; a $1.0 to $1.5 million private access road between Itea and Viniani; installation of a third shiploading bridge at Itea; and an industrial plant for processing bauxite. The latter would involve production of alumina, with Bauxites Parnasse in partnership with a foreign firm. As part of the overall plan, Bauxites Parnasse, in cooperation with the Chase Manhattan Bank and the United States companies, National Steel Corp. and Southwire Corp., planned to establish a 600,000-ton-per-year alumina plant, with provision for doubling capacity at a later date. The plant would be located in the Parnassos area. Although 60% of the investment was to come from foreign sources, Bauxites Parnasse was to hold a 51% equity position.

The annual bauxite export quota was raised from 1,860,000 tons in 1973 to 3,085,000 tons in 1974. For 1975, the quota was fixed at 3,155,000 tons. Exports were to go to EC and Western European countries. Actual total exports of bauxite in 1973 were 1,369,364 tons, valued at $11.2 million. According to Bank of Greece data, exports of alumina and aluminum for the period January to October 1974 amounted to $84 million compared with $58.8 million during a similar period of 1973.

**Copper.**—The Hellenic Chemical Products and Fertilizers Co. Ltd. (HCPF), of the Bodossakis Group, which owned the mixed sulfides mines at Kassandra, northwest of Ierissos Bay, Chalkidiki, completed

work in the mines which would enable extraction of recently discovered cupreous (2% Cu) ore. The company expected to extract 30,000 tons of chalcopyrite ore in 1974 and use it to begin feeding its new 300,000-ton-per-year flotation plant built in the area. HCPF also owned chalcopyrite deposits (3% Cu) at Ermioni, Peloponnisos. Construction work on HCPF's 60,000-ton-per-year chalcopyrite ore concentration plant near Ermioni continued during the year and was scheduled for completion in 1975. Also, exploitation of the Skouries copper mines on the Chalkidiki Peninsula reportedly was under consideration. Another location to be developed was the sulfide ore deposit at Mavri Petra. At Olympias, an ore concentration plant was to be built, and improvements were to be made to mine approach facilities and to mining equipment. Investments totaling $15 million were to be made by HCPF.

Exploration for copper and other metals in Greece was continuing at yearend. During 1974, PUK explored in Northern Greece in the Kilkis area for copper, lead, and zinc, while Bethlehem Steel Corporation explored, mainly in the Kastoria, Florina, and border areas, for the same metals plus nickel and chromium.

**Gold and Silver.**—The Olympias ore of HCPF reportedly was rich in gold and silver, but no percentages were available. HCPF conducted feasibility studies for establishing a sulfuric acid plant, lead and zinc metallurgical operations, and facilities to separate the precious metal content of the ores.

The Canadian Masivor Corporation, in cooperation with the Greek company Greek Gold Mines, was to invest $600,000 in developing gold mines in the area of Servia, Kozani. A local corporation, valued at $170,000, was established for this purpose. The Bodossakis Group and PUK were also exploring for gold in Macedonia. In addition, the Greek Government reportedly had reserved the Aggitou River area in Macedonia for public use in exploring and developing gold deposits.

**Iron and Steel.**—Consumption of steel in Greece was about 1.2 million tons, down about 40% from that of 1973, and consumption was to remain about the same for 1975. A shortage of scrap imports was a major problem throughout 1974.

Greek shipowner Aristomenis Karageorgis planned to establish a 500,000-ton-per-year capacity steel mill in Peloponnisos. An investment of $335 million would be made, and the plans included provision for expansion of capacity to 2 million tons. The electric arc furnaces of the proposed plant would be fed with imported ferrous metal agglomerate and scrap iron. Initial production was projected to be 200,000 tons of steel pipe (over 10 centimeters in diameter) and 300,000 tons of steel sheet, shipbuilding plate, and other steel products. All products except shipbuilding plate and products necessary to meet local shortfalls would be exported. The 100% Greek-owned project would be completed within 30 months after the Government of Greece and Karageorgis reach agreement.

The No. 1 blast furnace of Halyvourgiki S.A. was shut down for relining on February 24. A total of 2,503,000 tons of iron had been produced since the furnace was first lit in June 1963. For the second campaign of the furnace, the hearth diameter was to be increased to 7 meters, which was expected to give a 15% increase in production. The furnace also was to be relined with carbon brick and other materials that were used in the first campaign.

Greek shipbuilding continued to thrive during the year, with vessels totaling about 3.5 million tons scheduled to be commissioned. The tonnage scheduled for delivery in 1975 exceeded 5 million tons. About 63% of the 24 million tons of new ships ordered by Greek-owned concerns were scheduled to be delivered during 1976 and 1977. The expansion was partly due to an increase in the number of supertankers being built as a result of the energy crisis.

The Greek Government approved a $135 million appropriation for the establishment of a ship-repairing and shipbuilding facility at Messinia in Pylos Province. The new shipyard was to have the capacity to repair or build ships of up to 500,000 deadweight tons. Included in the new unit were: (1) facilities for unballasting and mooring ships; (2) a permanent dry dock for building tankers; (3) a floating dock; and (4) three slips for building ships up to 60,000 tons. Ownership would be by a joint stock company set up by A. Karageorgis. The capital of this company was to total $14 million plus a loan of $121 million from the United States.

In May, an agreement reportedly was reached for a $15 million expansion of the

Bodossakis iron pyrites and ferrous sulfide mining complex located in Chalkidiki. The expansion was to take place over a 3-year period.

**Manganese.**—At its manganese mines near Drama, Financial Mining and Industrial Shipping Corporation (FIMISCO) of the Skalistiri Group planned to complete by yearend a plant for grinding and packing battery-grade manganese dioxide. FIMISCO raised production of dressed manganese from 6,222 tons in 1973 to 7,920 tons in 1974.

The Greek Government signed an agreement with two Japanese companies approving the establishment of a Greek company that would produce electrolytic manganese dioxide. The two companies were Tekkosha Co., Ltd., and Mitsubishi Corporation. The new $6 million company, called Greece Tekkosha, was to receive 65% of its financing from Mitsubishi. A 12,000-ton-per-year plant was to be established at Salonika, and products were to be exported to various European countries beginning in 1975.

**Nickel.**—Mine production of nickel totaled 28,522 tons in 1974. Exports of ferronickel containing 35% nickel, through midyear 1974, were valued at $30,004,000, the best since 1970 (neglecting inflation), when $24,240,000 worth of ferronickel was exported in the same period. During 1974, officials of Société Minière et Métallurgique de Larymna S.A. (LARCO) indicated that production orders would exceed production capacity and that stocks would have to be used to meet demand requirements.

A plan by LARCO to construct a 7-mile-long conveyor belt to transport ore from the mines at Euboea to shiploading facilities at Politika was abandoned. Instead, a 12-kilometer tarred road was built connecting the facilities. In addition, LARCO conducted exploration surveys for the development of newly acquired laterite mines at Vryssakia, which were expected to yield 200,000 tons of ore in 1974. The company also purchased new equipment for use at its underground mine at Agios Ioannis in Larymna in order to reduce mining costs and manpower.

Nickel-bearing iron ores reportedly were located in the Lokris Larymna area and central Euboea. Verified reserves as of September were put at 10 million tons, with indications of the existence of many times that quantity.

## NONMETALS

**Cement.**—A total of $233 million was under investment in September, which would eventually increase production of cement to 13.5 million tons per year. One private developer received Government of Greece approval to construct a 500,000-ton-per-year cement plant on the island of Crete. However, the issuing by the Government of new licenses for cement plant construction on Crete was temporarily suspended during the year. The ruling caused General Cement Co. Ltd. (AGET), Titan Cement Co., and Chalkis Cement Co. S.A., to cancel plans to jointly build a 600,000-ton-per-year plant on Crete. As a result of completion of a third 1-million-ton-per-year cement production unit at Mikro Vathy, Avlis, Chalkis Cement raised its annual production capacity to 1.7 million tons in 1974. Completion of a fourth unit of equal size was scheduled for late 1975 and would raise annual cement production capacity to 2.7 million tons. In March, the company began operation of its bag-loading system, with a loading capacity of 5,000 sacks per hour.

The Greek Concrete Co., which produced and distributed ready-mixed concrete, inaugurated operation of its concrete producing plant at Thessaloniki in February. At this time, the company also announced plans to invest $13.3 million in 16 new plants, 240 mixing trucks, and 40 mixed concrete pumping vehicles. The total production capacity of the 16 units was to be 6,000 cubic meters per day of ready-mixed concrete.

AGET was forced to delay plans to build a 1.3-million-ton, $50 million cement plant at Methana in Eastern Peloponnisos, on the Sardonic Gulf. The plant was scheduled to be operational in 1976. However, at its existing Methana facility, AGET was to install $4 million worth of Fuller Co. (U.S.) equipment. This included two Traylor finish grinding systems, each employing a 15- by 45-foot, 6,000-horsepower ball mill, all of which would bring production up to 4,000 tons per day of clinker.

In January, the 6,500-deadweight-ton bulk cement carrier *Theseus* was launched at the Japanese shipyards of Ishikawajima

Harima in Fukuoka, Japan, and was scheduled for delivery at midyear. Halyps Cement Co. S.A., was to complete it Skaramanga plant by yearend 1974. Capacity was to be increased from 460,000 to 1 million tons.

An application to build a cement plant at Aitoloakarnania was submitted to the Ministry of Industry. An investment of $15 million was to be made in a plant designed to produce 900,000 tons of cement per year, all for export. It was expected that approval would be granted, subject to strict adherence to government regulations. These included: (1) proper distance from archaeological sites, developed areas, and tourist installations; and (2) antipollution precautions. In another action, the Greek Government approved the import of $22 million in foreign funds by A. Karageorgis to invest in enlarging to 1,000,000 tons per year the capacity of the proposed new cement works to be constructed at Messinia, South Peloponnisos. The approval was received under privileges accorded by Law 2687. The Ministry of Commerce reportedly approved total exports of 1.2 million tons of cement for the year.

**Clays and Other Nonmetals.**—Silver and Baryte Ores Mining Co. S.A., of the Eliopoulos Group continued work on a $7 million investment project aimed at improving and increasing its bentonite, kaolin, perlite, and barite facilities on Milos Island by 1975. As part of the project, the following were completed: A 220,000-ton-per-year bentonite drying plant; a second jetty for loading ships, with a 700-ton-per-hour capacity; and a 25,000-ton-per-year kaolin pulverizer. The company expected to complete its new 300,000-ton-per-year capacity perlite processing plant by yearend.

**Fertilizers and Chemicals.**—HCPF expanded its Piraeous plant facilities during 1974. New additional capacity per day was to be: (1) single superphosphate fertilizers, 550 tons; (2) ammonium superphosphate fertilizers, 760 tons; (3) compound fertilizers, 150 tons; and (4) mixed fertilizers, 300 tons.

Oronzio de Nora–Impianti Electrochimici S.p.A., of Milan, Italy, was to build a new electrochlorination plant for HCPF at Piraeus. The contract reportedly covers engineering and supply of the complete plant, which was to be equipped with de Nora Seaclor, S.p.A. electrolyzers and use seawater as raw material. De Nora was also to supply the electrolyzers, a complete electrical conversion unit, and some ancillary equipment.

**Magnesite.**—Exports of magnesite earned $35.9 million in foreign exchange in 1973. FIMISCO of the Skalistiri Group obtained government approval in June to invest $14.5 million over a 5-year period for: (1) the purchase of heavy earth-moving and drilling equipment; (2) the expansion and improvement of the company's magnesite dressing plants, refractory brick plants, and dead burning installations; and (3) the erection of a flotation, calcination, and briqueting installation to exploit low-grade magnesite and wastes from which 50,000 tons per year of dead-burned magnesite would be produced.

Macedonian Magnesite Mining, Industrial, and Shipping Corporation of the Skalistiri Group was to bring its first rotary kiln at Mantoudi, Euboea, on-stream by yearend. The unit had a 50,000-ton-per-year capacity. Total production capacity of the Skalistiri Group in dead-burned magnesite was to be 330,000 tons per year by 1975.

Magnesite Mining Industrial and Commercial S.A. carried out exploration and development studies in the North Euboea area. Construction was to start in May 1975 on an ore dressing plant to process 87,500 tons per year of concentrate. Moreover, a 35,000-ton-per-year French rotary kiln was to be built for dead-burned magnesite production, starting in July 1975, and to be completed by the summer of 1976. In addition, the company was to buy $1.7 million worth of U.S. mining equipment. The Export-Import Bank was to provide $510,000 credit to help finance 30% of total equipment costs.

**Pumice.**—In April Hiotopoulos S.A. began operations at a $1.7 million pumice stone processing plant at Corinth. The unit was the first of its kind in Greece and was to process pumice stone for industrial purposes, mainly for export. The company reportedly hoped to earn $1.5 million annually from its exports.

In order to complete installation of mechanical equipment for processing pumice stone at its Gyali, Dodecanese quarries, Lava S.A. borrowed $200,000 from the Compañia Maritima Volcan of Panama.

**Silica.**—The principal glass manufacturer in Greece was HCPF, which produced con-

tainers at its Drapezona plant near Athens. Virtually all of the industrial silica sand was imported, with Belgium supplying about 60,000 tons per year and the Netherlands 10,000 tons per year.

## MINERAL FUELS

**Geothermal.**—Early in 1974, the PPC signed a contract with the Greek-French firm Hydrotechniki S.A.—Foramines S.A. to drill four 7-inch diameter boreholes to a depth of 1,000 meters each on the island of Milos. Drilling was expected to begin in April 1975 and be completed within 3 months. Officials hoped that the drilling would reveal a geothermal steamfield large enough to produce 50 megawatts of electric power. Other islands where geothermal sites existed and some exploration took place were Nisyros, Methana, Kamena Vourla, and Ikaria. Under the New Mining Code, geothermal energy resources are classified as mineral resources and as such only the State may prospect for them and exploit them.

**Peat and Lignite.**—Six new lignite burning units of 300 megawatts each were scheduled to be completed by 1983. One was to be installed at Megalopolis in Peloponnisos and the other five at the Kardia mines of Ptolemais in Northern Greece. PPC mines lignite for firing its thermal powerstations at Aliveri (40% lignite fired), and Ptolemais and Megalopolis (both 100% lignite fired). Reserves found at Aliveri in 1973 totaled 1.5 million tons of lignite, which PPC planned to start developing in 1975 and deplete within 2 or 3 years. At Megalopolis, the Horemi opencast mine (400 million tons proven reserves) was expected to be completed by May 1975. This was to feed the local thermoelectric, 300 megawatt unit at a rate of 4.5 million tons of lignite per year. The addition of a fourth unit for Megalopolis was being considered. Greek officials anticipated that development of indigenous lignite and peat reserves might increase their share of electric power generation from 35% in 1973 to 68% by 1985.

In Ptolemais, the Kardia A′ and B′ lignite-fired units were to be completed by April 1975 and were temporarily to be fed with lignite from the Main Field and Kardian mines until the South Field is developed. Development of the South Field reportedly was delayed because of protracted negotiations between the PPC and foreign manufacturers on the financial terms connected with the supply of equipment.

The PPC also planned exploitation of rich lignite deposits near the communities of Agios Loukos and Gavalas. The area of the deposits totaled 1.23 million square meters and much of it was expected to be strip mined.

A Greek Government official in September signed the Market Control Regulation which readjusted the price of lignite on the basis of thermal yield. This was the first price change since 1957. The low price previously allowed had caused a serious decline in mining operations.

Controversy continued over exploitation of the Philippi peat deposits. However, at least one delivery took place during the year as part of the Greek-Soviet agreement signed in 1973 to develop the deposits. In October, the Soviet freighter *Saliany* arrived at the port of Kavala with equipment that ENERGO-MACHEXPORT, the Soviet technical organization, was to use to construct the thermoelectric unit in the Philippi plain. Local villagers of the Pangaion area continued their opposition. Reportedly, no real progress was made during 1974 on the $89 million Philippi project, which was to include the construction of a 375-megawatt peat-burning powerstation. The Soviet organization had already been paid $17 million by the Greek Government as down payment and installment money for the supply of equipment.

**Petroleum and Natural Gas.**—The Greek Government made plans for revision of its regulations governing oil exploration and exploitation contracts. The revision reportedly would have included the provision that contracts would be awarded on the basis of international tenders at predesignated areas. About 50 applications for contracts were pending before the Government at yearend, and 30 of these were submitted in the first half of 1974. At least 15 firms were active in exploration during the year. These included: (1) Oceanic Exploration Co. of Denver in cooperation with three other companies, which were exploring an 8,509-square-kilometer tract offshore in the Thracean Sea; (2) An-Car Oil Co., Inc., of Boston, with 5,000 square kilometers offshore and onshore at Killini and on the islands of Cephalonia and Zantes; these exploration areas were in

addition to 6,500 square kilometers offshore and onshore in northeast and northwest Peloponnisos; and (3) the Anschutz Overseas Corp. of Denver, with 5,600 square kilometers onshore and offshore in the Thessaloniki Basin and Sigiticos Gulf, plus other tracts. Oceanic's fourth well, "Prinos 1", was completed in February when oil was struck at 8,500 feet. The oil flowed at a stabilized rate of 2,948 barrels per day through a ¾-inch choke. A second confirmation well was drilled and flowed at a rate of 8,000 barrels per day.

Brown and Root Co. of Houston, Tex., reportedly signed a turnkey contract with Oceanic for the engineering required for development of Oceanic's discoveries. Five platforms were to be built over a 2½-year period in the first phase at a cost of $100 million to $150 million. Production was expected to reach 50,000 barrels of oil, 1,000 tons of solid sulfur, 10,000 barrels of liquefied natural gas, and 10 million cubic feet of natural gas. If this production is achieved, it would cover about 25% of Greece's 1974 annual requirements of crude oil and all its sulfur requirements. In its second phase, Oceanic operations included exploitation of the Kavala gas find and further development of the Prinos deposit. At yearend, further negotiations between Oceanic and the Greek Government were about to take place.

In April, Serres Shipping, Inc. obtained search rights for natural gas in the areas of Pulos, Navarino, and Messinia Nomos. At about the same time, the Canadian Calvin Exploration and Development Company obtained governmental approval to conduct a 6-month geological and geophysical survey to spot oil-bearing areas in Greece. Offshore research by the company was to be carried out in the northern and southern part of the Aegean Sea and the Gulf of Corinth, and results of the survey were to be made available to private companies as well as to the Government. The first part of the program, in the northern part of the Aegean Sea, was to be completed in July.

Motor Oil Hellas was expected to complete expansion of its Agioi Theodori, export-oriented refinery by early 1975, when its capacity would be raised 1.8 million tons to about 7 million tons of refined oil. A fifth refinery with a capacity of 6 million tons per year was to be built by Hellenic Refineries Stran S.A. The project was to be located at Pachi, 26 miles west of Athens. Reportedly, harbor works, near the proposed refinery, for berthing of tankers of up to 600,000 deadweight tons were already at an advanced stage. The harbor works were estimated to cost about $25 million. Nevertheless, the new administration reversed decisions that had been made for land sale and expropriation at the site. Thus, at yearend prospects for the construction of this refinery were not favorable.

Greece's total refining capacity was reported as 19,700,000 tons, distributed among four refineries.

**Uranium and Nuclear Energy.**—Uranium exploration in the Xanthi area was temporarily suspended early in 1974, pending arrangements for more extensive drilling and testing. Samples tested reportedly registered 10 counts per second versus the 40 to 50 counts per second considered exploitable by U.S. standards.

The PPC took the first steps for the installation of a nuclear reactor generating station, which the PPC hoped to have in operation by 1983. Senior company executives were to visit the United States in order to negotiate for the supply of requisite quantities of uranium. Work on the site, yet to be selected, was to begin in 1977. Lavrion reportedly was the location of choice.

According to PPC officials, by the year 1984 local sources of energy will generate 65% of all electric energy in Greece. If Greece's first 600-megawatt nuclear reactor is operational by that time, oil reportedly will account for only 23% of all power generated.

The connection of the Greek electric power grid with Albanian production facilities was completed during the year. Initially, the 20-megawatt operaton was to be one way, to Greece, on the basis of a bilateral clearing-account trade agreement. It was anticipated that in the future the hookup would operate both ways.

**Other.**—*Solar and Wind Energy.*—The small island of Doroussa, in the Saronikos Gulf, was selected as the site on which to establish the Greek Center for Oceanological Research, which was to include the important section of Solartechnical Oceanology. Also, 34 nations decided to found the International Center for Solar and Wind Technological Research in Greece, also to be located on Doroussa. As a first step toward implementation of new plans in this area, members of the National Committee on Solar and Wind Energy were appointed by the Greek Government.

# The Mineral Industry of Hungary

By Joseph B. Huvos [1]

Hungary's mineral industry, like that of the other East European countries, is closely linked to that of the U.S.S.R. Its centrally planned economy is based on mutually coordinated production schedules, and planned targets are predetermined by the 1971–75 national plan for economic development. Hungary had no internationally significant mineral resources besides bauxite, the production of which amounted to 3.9% of the world total in 1974. Mineral fuels, iron, steel, and manganese were next in importance although their output was not significant by world standards. Most of the country's minerals and mineral product requirements such as fuels, metals, and nonmetallic minerals were imported.

Compared with 1973, pig iron output increased by 275,000 metric tons; crude steel by 139,000; finished rolled ferrous metals by 111,000; bauxite by 151,000; alumina by 38,000; and cement by 32,000. Natural gas production increased by 9.6 billion cubic feet and electric power output by 1,300 million kilowatt-hours. There were also increases in the output of aluminum metal, phosphatic fertilizers, and petroleum products.

Besides gains in mineral production as reported in the official press, there have also been reports of failures to reach planned goals in some areas of the mineral industry and failures to eliminate occasional material shortages. Expansion in the mineral industry was achieved by greater expenditure of capital and improved productivity.

There were about 78,000 blue-collar workers and about 10,000 university graduate engineers and technicians in the country's metallurgical industry. The mining industry employed over 130,000 including over 12,000 university graduate engineers and technicians, the chemical industry including petrochemicals employed almost 110,000 with nearly 13,000 university graduate engineers and technicians, and the electric power industry employed about 38,000 including 4,700 engineers and technicians.

To ease the shortage of labor, many employees were permitted to hold more than one job, and about 25,000 retired persons were allowed to supplement their income by returning to active employment.

Worknorms used in all branches of Hungary's industry required that a minimum output be achieved within a predetermined period of time. As in other countries having a centrally planned economy, Hungary's unions are not wage-bargaining organizations, but they actively promote production increases, improved productivity, and fulfillment of planned quotas. Monthly earnings of Hungarian workers and employees in industry averaged 2,693 forints,[2] 7.1% more than that of 1973.

Exploration and prospecting focused on coal, bauxite, and liquid hydrocarbons, and to a limited degree on nonmetallic minerals. While industrial investments were 9% higher than those of 1973, the value of unfinished projects at yearend 1974 exceeded 100 billion forints. In the mining industry, the value of new projects built was 5.1 billion forints, that of the metallurgical industry was 3.2 billion forints, that of the chemical industry including

[1] Foreign mineral specialist, Division of Coal.

[2] Values have not been converted from Hungarian currency units, forints (fts), to U.S. dollars owing to the wide variation between the official exchange rate and the value actually used for transactions. To convert forints into dollars, these rates may be used: The official exchange rate used for statistical purposes in 1974 was fts 9.15 = US$1.00; the tourist rate was fts 20.43 = US$1.00; and the rate used by Hungarian companies with the National Bank of Hungary was fts 43.2 = US$1.00.

petrochemicals was 7.3 billion forints, and that of the electric power industry was 6.3 billion forints.

In 1974, a number of plants and mines started operation. In the iron and steel industry a new rolling mill was started at the Lenin metallurgical works in Diósygör; in the mining industry a new dolomite mine started production at Alsótelkes, Borsod County; in the electric power sector a 100-megawatt gas turbine and a 730-megawatt thermal powerplant went online. Construction of some other major mining and industrial facilities continued during the year, including the Algyö natural gas processing plant, the U.S.S.R.-Lenin City gas pipeline, development of the Rákhegy II bauxite and Visonta lignite mine, the olefin plant at the Tisza chemical combine, the Pét nitrogen fertilizer plant, and the Bélapátfalva and Hejöcsaba cement plants. While construction of some plants was ahead of schedule, that of some others was behind planned targets in 1974.[3] The construction of some major projects begun in 1974 included site preparation work for a 11-million-ton-per-year oxygen converter steelplant at the Dunaújváros steel combine to become operational by 1977–78, and a rod and wire mill at the Ozd metallurgical plant.

In 1974, there were 9,314 accidents in the country's mining industry, 235 fewer than those in 1973; of this total, 37 were fatal, 8 fewer than in 1973. The metallurgical industry had 4,944 accidents in 1974, 339 fewer than in 1973, with 28 fatal accidents, 10 fewer than in 1973.

Of a total of about 9.6 billion tons of mineral products shipped in 1974, about 45% went by rail and 55% by road.

## PRODUCTION

Mineral production statistics were not officially reported for a number of commodities. Therefore, many of the data in the production table were estimated, and present at best an order of magnitude.

As reported, 68 minerals and mineral related products were produced in the country. Compared with 1973, industrial production in Hungary grew 8.2%, and production of most mineral commodities increased and reached planned targets in spite of shortages of some petrochemical feedstocks and steel semiproducts.[4] Growth of the mining industry was approximately 1.9%, somewhat short of its 2% target. Production of coal decreased 3.8%; that of nitrogenous fertilizer 3.1%.

Hungary's mineral production was mainly in Transdanubia, where all bauxite and most of the manganese ore, bituminous and brown coal, and almost half the oil was produced. The great plains region produced the remaining half of the crude oil and most of the natural gas. The northern mountainous provinces produced the rest of the coal, lignite, iron ore, nonferrous metals, and nonmetallic minerals of the country.

[3] Népszabadság (Budapest). V. 33, No. 33, Feb. 8, 1975, p. 1.
[4] Népszabadság (Budapest). Feb. 8, 1975, p. 1.

**Table 1.—Hungary: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| METALS | | | | |
| Aluminum: | | | | |
| Bauxite | thousand tons | 2,358 | 2,600 | 2,751 |
| Alumina | do | 520 | 655 | 693 |
| Metal, primary | | 68,183 | 67,885 | 69,043 |
| Copper: | | | | |
| Mine output, metal content [e] | | 1,200 | 1,200 | 1,200 |
| Metal: | | | | |
| Smelter, primary [e] | | 1,200 | 1,200 | 1,200 |
| Refined including secondary [e] | | 17,000 | 17,000 | 14,000 |
| Gold, mine output [e] | troy ounces | [r] 320 | [r] 320 | 320 |
| Iron and steel: | | | | |
| Iron ore | thousand tons | 695 | 681 | 545 |
| Pig iron: | | | | |
| Pig iron for steel | do | 1,964 | 2,002 | 2,290 |
| Pig iron for foundries | do | 80 | 86 | 73 |
| Total | do | 2,044 | 2,088 | 2,363 |

See footnotes at end of table.

## Table 1.—Hungary: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Ferroalloys ---- thousand tons | 26 | 23 | 23 |
| Crude steel ---- do | 3,273 | 3,327 | 3,466 |
| Steel semimanufactures, rolled only ---- do | 2,220 | 2,280 | 2,391 |
| Lead: | | | |
| Mine output, metal content [e] ---- | 2,368 | 2,500 | 1,600 |
| Metal, refined, secondary ---- | 4,000 | 8,000 | 13,500 |
| Manganese ore [2] ---- thousand tons | [r] 155 | 136 | [e] 125 |
| Silver [e] ---- thousand troy ounces | 42 | 64 | 64 |
| Zinc: | | | |
| Mine output, metal content [e] ---- | 4,800 | 4,800 | 3,000 |
| Smelter, secondary ---- | 733 | [e] 1,000 | [e] 1,000 |
| NONMETALS | | | |
| Cement, hydraulic ---- thousand tons | 2,969 | 3,405 | 3,437 |
| Clays: | | | |
| Bentonite ---- do | 79 | 73 | [e] 73 |
| Kaolin, crude and washed ---- do | [r] 65 | 83 | [e] 83 |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous: | | | |
| Gross weight ---- do | 1,825 | 1,969 | 1,908 |
| Nitrogen content ---- do | 374 | 404 | 391 |
| Phosphatic: | | | |
| Gross weight ---- do | 951 | 1,004 | 1,076 |
| Phosphorus pentoxide content ---- do | 181 | 190 | 204 |
| Lime, calcined ---- do | 637 | 669 | 636 |
| Peat (agricultural use) [e] ---- do | 65 | 65 | 65 |
| Perlite ---- | 85 | 96 | 93 |
| Pyrite: | | | |
| Gross weight [e] ---- | 7,000 | 7,000 | 7,000 |
| Sulfur content [e] ---- | 2,800 | 2,800 | 2,800 |
| Refractory materials, n.e.s.: | | | |
| Chamotte products ---- thousand tons | 169 | 172 | [e] 172 |
| Chrome magnesite products ---- do | 45 | 45 | [e] 45 |
| Sand and gravel: | | | |
| Gravel ---- thousand cubic meters | 10,207 | 10,701 | [e] 14,000 |
| Sand, common ---- do | 360 | 339 | [e] 339 |
| Sand, molding ---- thousand tons | 607 | 553 | [e] 553 |
| Stone: | | | |
| Dimension, all types ---- do | 4 | 3 | NA |
| Other: | | | |
| Dolomite ---- do | 805 | 840 | [e] 840 |
| Limestone ---- do | 6,186 | 6,895 | [e] 7,500 |
| Quartzite ---- do | 32 | 34 | [e] 34 |
| Sulfur: | | | |
| Elemental, byproduct ---- | 5,823 | 8,648 | [e] 9,500 |
| Sulfuric acid ---- thousand tons | 566 | 648 | 657 |
| Talc [e] ---- do | 16 | 16 | 16 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black [e] ---- | 4,200 | 4,200 | 4,200 |
| Coal: | | | |
| Bituminous ---- thousand tons | 3,671 | 3,410 | 3,209 |
| Brown ---- do | 15,534 | 15,463 | 15,281 |
| Lignite ---- do | 6,636 | 7,908 | 7,271 |
| Total ---- do | 25,841 | 26,781 | 25,761 |
| Coke: | | | |
| Coke oven coke ---- do | 777 | 603 | 639 |
| Gas coke ---- do | 363 | 497 | [e] 442 |
| Total ---- do | 1,140 | 1,080 | [e] 1,081 |
| Fuel briquets ---- do | 1,080 | 1,060 | [e] 1,060 |
| Gas: | | | |
| Manufactured ---- million cubic feet | 24,508 | 25,250 | [e] 25,250 |
| Natural, marketed ---- do | 114,295 | 170,251 | 179,892 |
| Petroleum: | | | |
| Crude: | | | |
| As reported ---- thousand tons | 1,977 | 1,989 | 1,997 |
| Converted ---- thousand 42-gallon barrels | 15,085 | 15,176 | 15,237 |
| Refinery products: [3] | | | |
| Gasoline, including naphtha ---- do | 10,319 | 10,846 | 11,399 |
| Kerosine ---- do | 4 | -- | -- |
| Distillate fuel oil ---- do | 18,367 | 19,925 | 22,066 |
| Residual fuel oil ---- do | 18,541 | 24,531 | 25,612 |
| Lubricants ---- do | 1,204 | 1,198 | [e] 1,198 |

See footnotes at end of table.

Table 1.—Hungary: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Petroleum—Continued | | | | |
| Refinery products—Continued | | | | |
| Other: | | | | |
| Liquefied petroleum gas [e] | thousand 42-gallon barrels | 740 | [r] 740 | 740 |
| Asphalt and btiumen | do | 2,763 | 3,458 | [e] 3,458 |
| Paraffin and petrolatum | do | [r] 116 | 160 | [e] 116 |
| Total | do | [r] 52,054 | 60,858 | [e] 64,589 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to the commodities listed, diatomite, gypsum, and other crude construction materials, such as common clay, as well as natural gas liquids are produced but available information is inadequate to make reliable estimates of output levels.
[2] Ore contains 18% to 26% manganese.
[3] Excludes refinery fuel and losses.

## TRADE

International trade has a high priority in Hungary's mineral economy. As in all other countries which have centrally planned economies, the country's trade is outlined in the national 5-year plan and is conducted by state enterprises directed by the Ministry of Foreign Trade. Foreign trade reflects national goals and priorities, and there is an implied commitment to achieve a favorable trade balance. Hungary's foreign trade continued to be oriented towards importing much needed fuels, minerals, and production equipment, while exports consisted mainly of industrial and agricultural products.

The value of Hungary's total trade turnover (exports plus imports) expanded 23.5%, from 79.3 billion forints in 1973 to 97.9 billion forints in 1974. Exports from Hungary were valued at 46.9 billion forints, 11.7% more than in 1973. The value of imports amounted to 51.0 billion forints, an increase of 36.7% over that of 1973. Hungary's trade with market economy countries in 1974 amounted in aggregate to 37.3 billion forints; trade with countries which had centrally planned economies totaled 60.6 billion forints.

The value of total commodity trade with various groups of countries in 1970 and 1972–74 follows, in billion forints:

| | 1970 | 1972 | 1973 | 1974 | Percent of increase 1973–74 |
|---|---|---|---|---|---|
| Countries with ruble accounts | 34.8 | 44.4 | 47.6 | 52.7 | 10.7 |
| Countries with dollar and other accounts | 21.7 | 25.0 | 31.7 | 45.2 | 42.6 |
| Total all countries | 56.5 | 69.4 | 79.3 | 97.9 | 23.5 |

As officially reported, Hungary traded with 73 countries in 1974. Almost two-thirds of the foreign trade was with countries which had centrally planned economies, with the U.S.S.R. having the largest share of the total. Compared with 1973, trade with some individual countries increased in 1974, in billion forints as follows: U.S.S.R. 26.7 to 29.5, East Germany 7.9 to 9.6, Czechoslovakia 6.8 to 8.1, West Germany 5.8 to 7.7, Poland 4.4 to 5.1, Italy 3.9 to 4.2, and Austria 2.6 to 4.2.

There was no significant change in Hungary's mineral trade patterns in 1974 compared with those of 1973. Mineral exports were insignificant, as in previous years. Fuels, metals, and minerals were not exported in important quantities except for bauxite, alumina, aluminum and aluminum products, and also some steel semimanufactures. Industrial products, machinery, pharmaceutical, and agricultural products made up the balance.

The most important categories of mineral commodity imports in 1974 were bituminous and anthracite coal, coke, crude

oil and petroleum products, natural gas, iron ore, pig iron, steel and steel semimanufactures, aluminum ingots, aluminum semimanufactures, nonferrous metals, and nonferrous metal products.

There was an increase in imports of crude oil from 6.6 million tons in 1973 to 6.8 million tons in 1974, fuel oil from 121,000 tons to 132,000 tons, and rolled steel from 644,000 tons to 734,000 tons. There was a decrease in imports of metallurgical coke from 1.13 million tons to 1.11 million tons and nitrogenous fertilizer from 459,000 tons to 415,000 tons.

**Table 2.—Hungary: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite ---------- thousand tons -- | 662 | 659 | Czechoslovakia 266; East Germany 180. |
| Alumina ---------- | 484,743 | 598,304 | U.S.S.R. 343,435; Poland 130,550; Austria 89,470. |
| Metal including alloys: | | | |
| Scrap [3] ---------- | 20,551 | 24,305 | Austria 9,381; Italy 8,004; West Germany 6,410. |
| Unwrought [3] ---------- | 74,695 | 86,256 | People's Republic of China 29,773; Turkey 9,224. |
| Semimanufactures [3] ---------- | r 22,863 | 24,537 | Poland 3,755; East Germany 3,726; Czechoslovakia 3,340. |
| Chromium oxide and hydroxide ------- | 503 | 117 | All to Italy. |
| Copper metal including alloys: | | | |
| Scrap ---------- | r 1,231 | 2,248 | West Germany 1,787; Austria 361. |
| Unwrought and semimanufactures ---------- | r 5,348 | 13,236 | West Germany 9,450; Austria 1,569. |
| Iron and steel: | | | |
| Scrap ---------- thousand tons -- | r 113 | 128 | Italy 104; Austria 11. |
| Pig iron and ferroalloys [3] -- do ---- | r 157 | 207 | Austria 58; Italy 50; Sweden 28. |
| Steel, primary forms [3] ----- do ---- | 208 | 188 | Austria 81; Yugoslavia 28; West Germany 21. |
| Semimanufactures [3] -------- do ---- | r 916 | 971 | Poland 128; West Germany 99; U.S.S.R. 77. |
| Lead: | | | |
| Ore and concentrate ---------- | 1,310 | 2,796 | All to Belgium-Luxembourg. |
| Metal including alloys, all forms --- | r 1,909 | 1,079 | Yugoslavia 689; Italy 260; Denmark 130. |
| Manganese ore and concentrate -------- | 7,376 | 14,052 | All to West Germany. |
| Nickel metal including alloys, all forms - | r 817 | 871 | West Germany 416; Netherlands 194; Austria 171. |
| Platinum-group metals: | | | |
| Waste and sweepings value, thousands -- | r $1,174 | $1,526 | All to West Germany. |
| Metal including alloys ----- do ---- | r $35 | NA | |
| Silver ---------- do ---- | $145 | NA | |
| Tungsten ---------- do ---- | $55 | NA | |
| Zinc: | | | |
| Ore and concentrate [4] ---------- | 5,643 | 5,736 | All to Poland. |
| Metal, all forms ---------- | 170 | 274 | Netherlands 200; Austria 74. |
| Other: | | | |
| Ash and residues containing unspecified nonferrous metals ---------- | r 14,100 | 18,437 | West Germany 7,358; Austria 6,044. |
| Base metals including alloys, all forms, n.e.s ---------- | 1 | 2 | Netherlands 1; Belgium-Luxembourg 1. |
| NONMETALS | | | |
| Cement, hydraulic [3] --- thousand tons -- | 26 | 72 | NA. |
| Clays and clay products: | | | |
| Crude, bentonite [3] ---------- | 25,422 | 23,379 | NA. |
| Products: | | | |
| Refractory (including nonclay bricks) [3] ---------- | 25,753 | 31,427 | NA. |
| Nonrefractory ---------- | 728 | NA | |
| Diamond: | | | |
| Gem ---------- value, thousands -- | r $708 | $727 | All to Belgium-Luxembourg. |
| Industrial ---------- do ---- | r $58 | NA | |
| Diatomite and other infusorial earth --- | r 1,513 | 1,651 | All to Austria. |
| Fertilizer materials: | | | |
| Manufactured, unspecified [3] -------- | r 210,320 | 231,730 | West Germany 45,454. |
| Ammonia ---------- | 11,042 | 23,238 | All to Yugoslavia. |

See footnotes at end of table.

## Table 2.—Hungary: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel: | | | |
| Dimension stone | 517 | NA | |
| Gravel and crushed rock | 80,576 | 54,693 | All to Yugoslavia. |
| Limestone [4] | r 17,079 | 25,008 | Yugoslavia 16,680; Poland 8,328. |
| Quartz and quartzite | 4,938 | NA | |
| Sand, excluding metal bearing | 26,705 | 23,803 | All to Yugoslavia. |
| Sulfur, sulfuric acid [3 5] | 20,551 | 81,425 | Yugoslavia 44,722; Romania 18,738; U.S.S.R. 13,027. |
| Other, crude | r 29,525 | 31,263 | West Germany 14,008; Austria 7,839. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt, natural | -- | 1,174 | All to West Germany. |
| Coal, brown [3] | 76,924 | 61,576 | NA. |
| Coke, from bituminous coal [3] | 58,418 | 79,607 | Austria 38,931; Italy 23,197. |
| Peat and briquets - value, thousands | r $54 | NA | |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 182 | 8 | All to Yugoslavia. |
| Refinery products: | | | |
| Gasoline do | r 2,122 | 2,199 | Austria 916. |
| Kerosine [3] do | 132 | 14 | U.S.S.R. 5; Poland 3. |
| Distillate fuel oil [3] do | r 641 | 90 | U.S.S.R. 51; Austria 35. |
| Residual fuel oil [3] do | r 1,384 | 1,444 | Austria 1,289. |
| Lubricants do | r 271 | 231 | Yugoslavia 32; Austria 27; East Germany 7. |
| Other: | | | |
| Mineral jelly and wax do | 111 | 153 | Italy 60; Austria 22; West Germany 21. |
| Nonlubricating oils, n.e.s do | 3 | NA | |
| Bitumen [3] do | 309 | 313 | Austria 122; Poland 77; West Germany 54. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 3,514 | 4,009 | Mainly to Yugoslavia. |

r Revised. NA Not available.

[1] Compiled from the 1972 edition of the Supplement to the World Trade Annual, v. 1 (Eastern Europe), Walker and Company, New York 1974 (prepared by the Statistical Office of the United Nations), unless otherwise noted. These data represent imports from Hungary as reported by selected trading partner countries except where Hungarian statistics are noted.

[2] Compiled from the 1973 edition of the World Trade Annual, v. 1–3, Walker and Company, New York, 1975 unless otherwise noted.

[3] Source: Official Hungarian trade statistics.

[4] Source: Official Polish trade statistics.

[5] Source: Official Romanian trade statistics.

## Table 3.—Hungary: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Oxide and hydroxide [3] | 39,628 | 344,947 | All from U.S.S.R. |
| Metal including alloys, all forms [4] | 126,734 | 140,956 | U.S.S.R. 127,238. |
| Chromite | 17,000 | 10,000 | All from U.S.S.R. |
| Cobalt, oxides and hydroxides | 8 | 17 | All from France. |
| Copper: | | | |
| Copper sulfate [4] | 4,346 | 6,124 | U.S.S.R. 6,054. |
| Metal including alloys, all forms | 4,226 | 35,322 | All from U.S.S.R. |
| Iron and steel: [4] | | | |
| Ore and concentrate thousand tons | 3,526 | 3,712 | U.S.S.R. 3,607. |
| Pig iron, ferroalloys, and similar materials do | r 230 | 269 | U.S.S.R. 261. |
| Steel, primary forms [5] do | 357 | 109 | Yugoslavia 55; U.S.S.R. 48. |
| Semimanufactures [5] do | 761 | 1,061 | U.S.S.R. 673; Czechoslovakia 96; Poland 84. |
| Lead: | | | |
| Oxides | r 2,458 | 1,050 | All from France. |
| Metal including alloys, all forms [3 4] | 11,208 | 12,991 | U.S.S.R. 12,150. |
| Magnesium metal including alloys, all forms [3] | r 444 | 350 | Mainly from U.S.S.R. |

See footnotes at end of table.

## Table 3.—Hungary: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Mercury ---------- 76-pound flasks -- | r 203 | 812 | All from Yugoslavia. |
| Molybdenum metal including alloys, all forms ---------- | r 12 | 20 | Austria 14; Japan 6. |
| Nickel metal including alloys, all forms - | r 354 | 148 | West Germany 131. |
| Platinum-group metals including alloys value, thousands -- | r $930 | $2,251 | All from West Germany. |
| Silver metal including alloys -- do ---- | r $597 | $2,481 | United Kingdom $2,123. |
| Tantalum, metal all forms ---- do ---- | $34 | NA | |
| Tin: | | | |
| Oxide ---------- long tons -- | -- | 22 | All from West Germany. |
| Metal including alloys [4] ---- do ---- | r 1,128 | 1,186 | United Kingdom 468; Denmark 327. |
| Titanium oxides ---------- | 3,052 | 4,024 | Italy 2,481; West Germany 1,178. |
| Tungsten metal, all forms ---------- | 1 | NA | |
| Zinc: | | | |
| Oxide ---------- | 941 | 546 | Yugoslavia 250; Belgium-Luxembourg 166. |
| Metal, all forms [3 4] ---------- | 21,402 | 20,712 | U.S.S.R. 6,656; Belgium-Luxembourg 1,351. |
| Other: | | | |
| Ores and concentrates, n.e.s [4] ------ | 22,116 | 15,988 | NA. |
| Metals including alloys: | | | |
| Metalloids, n.e.s ---------- | r 426 | 520 | All from West Germany. |
| Base metals, n.e.s ---------- | r 80 | 67 | France 50; Belgium-Luxembourg 17. |
| NONMETALS | | | |
| Abrasives, natural, grinding and polishing wheels and stones [3] ---------- | r 852 | 672 | Austria 292; Yugoslavia 150; West Germany 99. |
| Asbestos [3 4] ---------- | 19,780 | 21,601 | U.S.S.R. 18,855. |
| Barite and witherite ---------- | 12,903 | 10,198 | Yugoslavia 9,618. |
| Cement, hydraulic [4] --- thousand tons -- | 1,182 | 1,289 | U.S.S.R. 674; Romania 420. |
| Clays and clay products: [4] | | | |
| Fire ---------- | 75,427 | 72,055 | NA. |
| Kaolin ---------- | 23,634 | 22,019 | NA. |
| Other, crude, n.e.s [5] ---------- | 61,550 | 61,339 | Poland 19,003; Yugoslavia 7,183. |
| Products, refractory [3] ---------- | 22,346 | 87,784 | Czechoslovakia 64,375; U.S.S.R. 9,680. |
| Diamond, gem and industrial value thousands -- | r $734 | $723 | Belgium-Luxembourg $615; West Germany $108. |
| Diatomite and other infusorial earth --- | 720 | 1,609 | Iceland 1,263; France 346. |
| Feldspar and fluorspar ---------- | r 4,961 | 9,998 | Yugoslavia 6,614. |
| Fertilizer materials: [4] | | | |
| Crude, phosphatic thousand tons -- | 504 | 522 | U.S.S.R. 431; Algeria 86. |
| Manufactured: | | | |
| Nitrogenous ---------- do ---- | 366 | 459 | U.S.S.R. 133; Austria 138; Czechoslovakia 131. |
| Phosphatic ---------- do ---- | 380 | 686 | Austria 179; U.S.S.R. 141; Yugoslavia 133. |
| Potassic ---------- do ---- | 792 | 856 | U.S.S.R. 479; East Germany 315. |
| Mixed ---------- do ---- | 120 | 161 | Yugoslavia 111; West Germany 29; Austria 20. |
| Fluorspar and cryolite [3] ---------- | 969 | 1,000 | All from U.S.S.R. |
| Graphite, natural ---------- | 180 | 379 | All from West Germany. |
| Gypsum, calcined [4 5] ---------- | 46,799 | 47,251 | Poland 35,090. |
| Lime ---------- | -- | 8,001 | All from Austria. |
| Magnesite, calcined [4 6] ---------- | 77,749 | 84,973 | Czechoslovakia 59,926; U.S.S.R. 11,719. |
| Mica, worked ---------- | 27 | 14 | All from Switzerland. |
| Pigments, mineral, iron oxide and hydroxides ---------- | r 1,747 | 2,446 | West Germany 1,677; France 769. |
| Precious and semiprecious stones, except diamond --------- value, thousands -- | r $96 | NA | |
| Pyrite, gross weight [4] - thousand tons -- | 87 | 79 | NA. |
| Salt [3 5 7] ---------- do ---- | r 391 | 373 | Romania 245; U.S.S.R. 87; Poland 41. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked ------ | r 1,790 | 3,565 | Yugoslavia 2,577; Italy 748. |
| Worked ---------- | -- | 131 | All from Austria. |
| Quartz and quartzite ---------- | 1,135 | 215 | All from Netherlands. |
| Sand, industrial [4] ---------- | 82,141 | 83,088 | Belgium-Luxembourg 1,916. |
| Sodium and potassium compounds ----- | | | |
| Caustic soda [7] ---------- | 117,087 | 142,669 | West Germany 93,078; Romania 30,200. |
| Soda ash [5 7 8] ---------- | r 60,710 | 52,710 | Romania 36,200; Bulgaria 8,916; Poland 6,959. |
| Caustic potash [4] ---------- | -- | 127,866 | West Germany 47,061; Romania 29,382; France 23,723. |

See footnotes at end of table.

Table 3.—Hungary: Imports of selected mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Sulfur: [4] | | | |
| Elemental [5] ____ thousand tons | 70 | 183 | Poland 108; U.S.S.R. 75. |
| Sulfuric acid | 11,330 | | |
| Talc and natural steatite | r 729 | 1,571 | All from Austria. |
| Other nonmetals, n.e.s.: | | | |
| Crude other than meerschaum | 1,009 | 1,085 | All from West Germany. |
| Oxides and hydroxides of magnesium, strontium and barium | r 234 | NA | |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black [4] | r 6,049 | 13,335 | U.S.S.R. 9,911; West Germany 906. |
| Coal, anthracite and bituminous [4 6] thousand tons | 1,660 | 1,470 | Czechoslovakia 573; Poland 512; U.S.S.R. 385. |
| Coal briquets [4] ____ do | 441 | 416 | All from East Germany. |
| Coke, all types [4 5 6] ____ do | r 1,205 | 1,207 | U.S.S.R. 634; Czechoslovakia 287; Poland 286. |
| Gas, natural [4 7] ____ million cubic feet | 200 | 200 | All from Romania. |
| Hydrogen, helium and rare gases | (9) | 19 | All from West Germany. |
| Petroleum: | | | |
| Crude [4] thousand 42-gallon barrels | 45 | 48 | U.S.S.R. 42; Iraq 5. |
| Refinery products: | | | |
| Gasoline [4] ____ do | r 1,119 | 1,288 | U.S.S.R. 981. |
| Kerosine [4] ____ do | r 887 | 871 | U.S.S.R. 868. |
| Distillate fuel oil [4] ____ do | r 2,332 | 4,055 | U.S.S.R. 2,511. |
| Residual fuel oil [4] ____ do | 484 | 803 | U.S.S.R. 773. |
| Lubricants ____ do | 98 | 81 | Austria 42; Netherlands 18; Belgium-Luxembourg 9 |
| Other: | | | |
| Mineral jelly and wax ____ do | 1 | (10) | All from West Germany. |
| Nonlubricating oils, n.e.s ____ do | 8 | 12 | Austria 6; Netherlands 5. |
| Bitumen and other residues ____ do | -- | -- | |
| Bituminous mixtures, n.e.s ____ do | 8 | 1 | All from West Germany. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals [8] | 30,319 | 22,491 | Yugoslavia 11,111; U.S.S.R. 9,368. |

r Revised. NA Not available.
[1] Compiled from 1972 edition of the Supplement to the World Trade Annual, v. 1 (Eastern Europe), Walker and Company, New York, 1974 (prepared by the Statistical Office of the United Nations), unless otherwise noted. These data represent exports to Hungary as reported by selected trading partner countries except where Hungarian statistics are noted as the source.
[2] Compiled from 1973 edition of the World Trade Annual, vs. 1-3, Walker and Company, New York, 1975 (prepared by the Statistical Office of the United Nations), unless otherwise noted.
[3] Source: Official trade statistics of U.S.S.R.
[4] Source: Official trade statistics of Hungary.
[5] Source: Official trade statistics of Poland.
[6] Source: Official trade statistics of Czechoslovakia.
[7] Source: Official trade statistics of Romania.
[8] Source: Official trade statistics of Bulgaria.
[9] Reported only as a value of $154,000.
[10] Less than ½ unit.

## COMMODITY REVIEW

### METALS

In general, development of ferrous and nonferrous industries reached goals foreseen by the 1974 annual plan; growth was the largest in the aluminum and iron and steel industries.

Of all metals or metallic ores needed by Hungary, only bauxite was in plentiful supply domestically. Almost all other mineral-related products had to be imported and included chromite, copper, iron ore, pig iron, steel including semimanufactures, lead, magnesium, molybdenum, nickel, tin, tungsten, and zinc.

**Aluminum.**—Hungary's three reduction plants, Ajka, Inota, and Tatabáya, had a total capacity of about 90,000 tons in 1974. Primary metal production was 69,043 tons, an increase of 1.7% over that of 1973. According to a long-range agreement with the U.S.S.R. concluded in 1962, Hungary imported substantial amounts of primary aluminum metal from the Volgograd reduction plant in the U.S.S.R., supplied

with Hungarian alumina. A similar agreement was concluded also with Poland.

Hungarian exports of aluminum ingots to 24 different countries in 1974 totaled 54,727 tons, 31,529 tons less than in 1973; this included 19,030 tons to European seaports, 6,254 tons to Austria, 4,738 tons to Finland, 4,310 tons to the People's Republic of China, 3,924 tons to Brazil, 3,800 tons to Poland, and 3,267 tons to Turkey. Aluminum products exported totaled 28,330 tons, including 9,661 tons to Romania, 5,349 tons to East Germany, 2,492 tons to Czechoslovakia, 1,467 tons to Bulgaria, and 1,217 tons to Finland.

In 1974, Hungary's aluminum supply position was as follows, in thousand tons:

| | |
|---|---|
| Production of primary aluminum | 69.0 |
| Production of secondary aluminum [e] | 14.0 |
| Imports (metal including products) | 144.9 |
| Exports (metal including products) | 88.1 |
| Apparent consumption | 139.8 |

[e] Estimate.

Hungary operated three alumina plants, Ajka, Almásfüzitö, and Mosonmagyaróvár, with a total capacity of about 700,000 tons per year. Production was 693,000 tons in 1974, an increase of 5.8% over that of 1973. Exports of alumina amounted to 626,292 tons in 1974, an increase of 27,988 tons over that of 1973, and included 331,646 tons to the U.S.S.R., 152,400 tons to Poland, 96,415 tons to Austria, 23,440 tons to East Germany, 11,926 tons to Czechoslovakia, 5,216 tons to Romania, and 5,000 tons to the Netherlands.

Hungary operated five bauxite mines in Transdanubia northwest of Lake Balaton, located at Kislöd, Halimba, Nyirád-Darvastó, Gánt, and Kincsesbánya. Output of bauxite was 2.75 million tons, an increase of 5.8% over that of 1973, and amounting to about 3.6% of total world production. Increased production resulted mainly from commissioning of the new Halimba mine still under development. Exports of bauxite, the only nonferrous metal ore exported in significant quantities by Hungary in 1974, amounted to 559,000 tons, 100,000 tons less than that of 1973, and included 265,766 tons to Czechoslovakia, 179,973 tons to East Germany, and 113,284 tons to Poland.

Hungary's total bauxite reserves were estimated at 150 million tons in 1972; this included 76 million tons of minable reserves, a decrease of about 25% for the 1969–72 period.[5] The quality of Hungarian bauxite continued to deteriorate.

Hungary's aluminum industry is operated by the Hungarian aluminum industry trust (MAT). The trust covers all activities in the field of exploration and mining of bauxite, the production of alumina, primary metal, and semifinished and finished products. Three companies are involved in bauxite mining; of these the bauxite exploration company performs the drilling for exploration of bauxite and for ground water control, and the Fehér County bauxite mining company and the Bakony bauxite mining company do the mining, with one-third of the total mined by the former, and two-thirds by the latter.[6] Alumina is produced by the Ajka and the Almásfüzitö alumina enterprises; reduction of alumina to aluminum takes place at the Ajka, Inota, and Tatabánya plants; design and construction of new plants is performed by the designing institute of the Hungarian aluminum corporation (ALUTERV).

New plant construction was planned at the Almásfüzitö alumina plant to increase capacity from 285,000 tons to 325,000 tons per year. The $17 million expansion project is scheduled to become operational by 1977.

Hungary gave assistance to several countries for the construction of aluminum industry projects. A 200,000-ton-per-year alumina plant built with Hungarian assistance was commissioned at Korba, India, in 1974. In addition to designing the plant, Hungary also gave assistance in construction and startup. At the 300,000-ton-per-year Obrovac alumina plant under construction in Yugoslavia, plant design and much of the equipment was provided by Hungary; Hungary also trained the plants' employees. In the Malagasy Republic, Hungarian aluminum industry experts made a feasibility study for an alumina plant to be supplied with bauxite from nearby deposits. In Greece, Hungary made a feasibility study for a 600,000-ton-per-year alumina plant for the Bauxite Parnasse Mining Co.

Hungary processed much of its aluminum domestically. Production of semiproducts amounted to about 140,000 tons in

[5] Bányászat (Budapest). V. 107, No. 9, September 1974, p. 617, and other sources.

[6] Bányászat (Budapest). Bemutatjuk a Bakonyi Bauxitbánya Vállalatot (The Bakony Bauxite Mining Company). V. 107, No. 11, November 1974, pp. 753–761.

1974, an increase of 10,550 tons over that of 1973; endproducts totaled about 115,000 tons, an increase of 5,500 tons. Expansion of Hungary's aluminum processing industry continued with the appropriation of $49 million for the expansion of the Székesfehérvár lightmetal works.

**Copper.**—In addition to 8,000 tons of copper concentrate containing 1,200 tons of copper produced at the Gyöngyösoroszi mine in 1974 and processed at the Metallochemia Co. smelter in Nagytétény-Diósd, Hungary produced about 14,000 tons of refined copper at the Csepel metal works, 17.6% less than in 1973. Imports totaled 42,633 tons of copper including semiproducts, and 8,746 tons of castings, fittings, and scrap materials in 1974; 33,128 tons of copper were from the U.S.S.R.

**Iron Ore.**—Hungary's only iron ore mine located at Rudabánya, in north Hungary, produced 545,000 tons of iron ore in 1974, 136,000 tons less than that of 1973. Iron content of the ore was 23.5%, and the ore supplied 11.7% of Hungary's iron ore requirements. Hungary imported 4.1 million tons of iron ore, including 3,973,000 tons from the U.S.S.R. and 101,000 tons from India.

At the beginning of 1974, the measured, indicated, and inferred reserves of iron ore in place (categories $A+B+C_1$) totaled 31.6 million tons, and averaged 24.4% Fe; speculative reserves in place (category $C_2$) totaled 14.7 million tons.[7]

**Iron and Steel.**—Ferrous metallurgy remained the most important branch of Hungary's metals industry in 1974. Crude steel production was 3.5 million tons, an increase of 139,000 tons over that of 1973. Pig iron production was 2.4 million tons, an increase of 275,000 tons over that of 1973. Among steel semimanufactures, rolled products totaled 2.4 million tons, an increase of 4.9% over that of 1973. A range of rolled semimanufactures was imported totaling 734,000 tons, while exports for the same period amounted to 607,000 tons.

Among the most important projects that went onstream in the iron and steel industry in 1974, were the steel mill at the Lenin metallurgical works located at Diósgyör in north Hungary. The $45 million, 400,000-ton-per-year plant was equipped with machinery from the East German Ernst Thälmann heavy equipment construction combine. Process control equipment was supplied by the U.S.S.R. and Czechoslovakia, and the furnaces by Austria and France. The plant will have 1,200 employees.[8]

Large-scale reconstruction of the Ozd metallurgical works was started in 1974, it will cost $100 million and take 3 years; a 110-ton converter is to be started in 1975. Total capacity of the plant reportedly will be 1.1 million tons per year of steel to be raised later to 1.4 million tons. A wirebar mill, also under construction, reportedly will start production in 1975.

Long-range reconstruction plans have been prepared for the Csepel metal works near Budapest; the cost is to be $100 million every year for 10 years. Ultimately, the plant is to employ 33,000 persons.

Site preparation has started at a new steel plant in Dunaújváros which will include 1.1-million-ton-per-year basic oxygen steel converters. An oxygen plant is to be commissioned in 1976, and one of two converters will start operating in 1977, the other in 1978.

**Lead and Zinc.**—Output of lead-zinc ore was 163,000 tons in 1974 at Gyöngyösoroszi in north Hungary. The ore contained an estimated 1,600 tons of recoverable lead and 3,000 tons of recoverable zinc. Of the zinc concentrates produced, 4,200 tons were exported to Poland and 2,621 tons to Belgium. The 2,000 tons of lead concentrate produced were processed domestically at the Metallochemia plant in Nagytétény. Hungary imported 11,101 tons of lead and 6,952 tons of zinc from the U.S.S.R. in 1974.

Refined lead output was 13,500 tons, an increase of 5,500 tons compared with that of 1973, and secondary zinc output was 1,000 tons.

**Manganese Ore.**—Manganese ore output totaled an estimated 125,000 tons, 11,000 tons less than that of 1973. Production of manganese ore has declined since 1965, when 213,000 tons was produced. At the beginning of 1974, measured, indicated, and inferred reserves of manganese ore in place (categories $A+B+C^1$), amounted to 43.1 million tons, and speculative reserves in place (category $C_2$) amounted to 36.5 million tons. Average composition of ores was 21.6% Mn and 9.2% Fe. About one

[7] Horváth, J. A. Hazai Nyersvasgyártás Ercbázisa (Hungarian Iron Ores). Kohászat (Budapest). V. 108. No. 2, February 1975, p. 57.

[8] Figyelö (Budapest). Nemesacél Diósgyörböl (Alloy Steel from Diósgyor). V. 19, No. 14, Apr. 2, 1975.

tenth of the ore was oxide containing 26.1% Mn and nine tenths was carbonaceous with 18.7% Mn.[9] Hungary's manganese mines are at Urkút and Csárdahegy, not far from the Halimba bauxite mines, north of Lake Balaton. Hungary imported 14,614 tons of manganese ore from the U.S.S.R.; 11,997 tons of ore were exported to Czechoslovakia and 3,176 tons to West Germany in 1974.

Hungary also imported 13,306 tons of 75% to 80% ferromanganese in 1974, including 19,367 tons from the U.S.S.R. and 14,096 tons from Norway.

## NONMETALS

As in previous years, Hungary was self-sufficient only in the following nonmetallic minerals: Lime, bentonite, perlite, diatomite, sand, and gravel. Most of the nonmetallic minerals used in the country had to be imported, and included asbestos, barite, cryolite, fluorspar, graphite, magnesite, mica, phosphates, salt, soda ash, sulfur, and pyrites.

**Cement.**—Hungary's four operating cement plants produced 3.4 million tons in 1974, or 0.9% more than that of 1973. Work continued on construction of the Hejöcsaba and Bélapátfalva cement plants. The $230 million, 1.5 million-ton-per-year Hejöcsaba plant was to start operating by yearend 1974, but test runs will begin only in 1975, and full capacity is to be reached in 1978. Technology was by the West German firm Polysius A.G., and the equipment was built in Czechoslovakia. New limestone and clay reserves near the plantsite are sufficient to maintain planned production levels for 50 years. The old 430,000-ton-per-year Hejöcsaba cement plant was closed in 1974. Hungary imported 974,000 tons of cement in 1974, including 680,000 tons from the U.S.S.R.; 85,000 tons from Romania, 82,000 tons from Czechoslovakia, 78,000 tons from Austria, and 39,000 tons from East Germany.

**Clay.**—Clay production in 1974 was unchanged compared with that of 1973. A new ceramic-quality clay was discovered and a mine was established at Füzérradvány in 1974.

**Corundum.**—Hungary produced artificial corundum by the fusion of domestic bauxite in electric arc furnaces. The artificial corundum plant was located at Mosonmagyaróvár; it supplied Hungary's domestic abrasives industry. Exports included 9,703 tons of abrasives shipped to Romania and 6,483 tons to Bulgaria in 1974.

**Fertilizer Materials.**—Fertilizer material production totaled almost 3 million tons containing 595,000 tons of nutrient,[10] an increase of 1,000 tons of nutrient compared with that of 1973. Of the fertilizer produced in 1974, 65.7% was nitrogen and 34.3% was phosphorus fertilizer. There was no significant change in the trade patterns for fertilizer materials, and substantial quantities had to be imported to satisfy demand. Imports of nitrogenous fertilizer totaled 415,000 tons, a decrease of 9.6% compared with that of 1973. Of total imports of 990,949 tons of potassic fertilizer (in terms of 40% $K_2O$) in 1974, 566,765 tons came from the U.S.S.R., 385,679 tons from East Germany, and 38,505 tons from West Germany.

*Phosphate.*—Hungary has no phosphatic raw materials of its own; the country imported a total of 978,433 tons of phosphatic fertilizer materials (in terms of 18% $P_2O_5$) in 1974, an increase of 42.6% over that of 1973. Imports included 242,175 tons from Yugoslavia, 156,836 tons from Austria, and 140,901 tons from the U.S.S.R. Hungary imported 603,296 tons of phosphate rock and concentrates in 1974, 15.5% more than that of 1972; the U.S.S.R. supplied 453,174 tons, Algeria supplied 102,629 tons, and Morocco 47,493 tons.

In 1975, there were plans to increase superphosphate production at the Tisza chemical combine by 80,000 tons with the present equipment. Hungary and Morocco signed a long-term contract; Morocco will supply Hungary with 135,000 tons of crude phosphate rock and 20,000 tons of superphosphate in 1975, and 230,000 tons of crude phosphate rock and 20,000 tons of superphosphate each year thereafter. An agreement was signed between the U.S.S.R. and Hungary for Hungarian participation in the development of the Kingisepp phosphorite deposits in the U.S.S.R. Hungary is to supply machinery and goods in exchange for deliveries by the U.S.S.R. of complex phosphatic fertilizer over a period of 10 years.

*Potash.*—Hungary imported all of its potash requirements totaling 990,949 tons (in terms of 40% $K_2O$) in 1974, 15.7% more than that of 1973; the U.S.S.R. supplied

[9] Kohászat (Budapest). V. 18, No. 2, February 1975, p. 60.

[10] The active ingredients nitrogen, and phosphorus are expressed as N, and $P_2O_5$, respectively.

566,765 tons, East Germany supplied 385,679 tons, and West Germany supplied 38,505 tons.

*Nitrogen.*—Nitrogen production, in terms of 20.5% nutrient content, was 1,908,000 tons, a decrease of 3.1% compared with that of 1973. Hungary imported 415,222 tons of nitrogen fertilizers in 1974, of which 169,722 tons came from the U.S.S.R., 149,620 tons from Czechoslovakia, and 86,530 tons from Austria.

Hungary's nitrogen industry is divided into four industrial organizations which include the Pét nitrogen works (PNM), the Borsod chemical industry combine (BKV), the Tisza-Region chemical combine (TVK), and the Tisza-Region chemical works (TVM).

Construction continued on several nitrogen industry projects in 1974. Commissioning of the 1,000-ton-per-day, $440 million Pét ammonia plant is to take place early in 1975, jointly with that of a 600-ton-per-day carbamide plant, which uses Belgian technology and equipment. Nitric acid and ammonium nitrite capacities were also scheduled for commissioning in 1975 at the PNM.

A 15-year contract for cooperation in the field of phosphatic fertilizers was signed by both Hungary and Yugoslavia. According to the contract Hungary extends a credit of $15 million to Yugoslavia for developing the Prahovo fertilizer plant of the Bor Mining and Smelting Enterprise. Hungary will receive phosphatic fertilizers for a period of 15 years in exchange for providing equipment for nitrogen fertilizer production. Hungary gave technical assistance to Poland for building a mixed fertilizer plant based on Hungarian technology and engineering.

**Lime.**—Production of lime was 636,000 tons in 1974, a decrease of 4.9% compared with that of 1973. The Budapest-based Chemimas Co. designed and built a new type of lime kiln which was exported to East Germany, Czechoslovakia, and several West European countries in 1974.

**Stone.**—*Dolomite.*—A new dolomite mine has been developed at Alsótelkes in Borsod County by the State Ore and Mineral Mining Co., with estimated reserves of 8 million tons. Production of the mine will be absorbed by the metallurgical and chemical industry of Borsod County.

**Sulfur and Sulfuric Acid.**—The country produced an estimated 9,500 tons of by-product sulfur in 1974, 9.9% more than that of 1973. Imports amounting to 183,478 tons came in 1973 mainly from Poland (108,248 tons) and the U.S.S.R. (75,198 tons). Sulfuric acid production was 657,000 tons in 1974, an increase of 1.4% over that of 1973. The country's sulfuric acid was produced mainly from imported native sulfur.

## MINERAL FUELS

Hungary's primary energy production from fossil fuels, fuelwood, and hydroelectric power increased from 20.3 million tons of standard fuel equivalent in 1973 to 20.8 million tons in 1974. The output of crude oil increased from 1,989,000 tons to 1,997,000 tons, and that of natural gas from 170.3 billion cubic feet to 179.9 billion cubic feet. The share of these two fuels in the country's energy supply decreased from 56.4% to 55.5% during the 1973–74 period. In 1974, Hungary produced 25.8 million tons of coal and lignite. The share of coal (bituminous coal, brown coal, and lignite) in the country's primary energy supply increased from 40.4% in 1973 to 41.1% in 1974. During the next 5 years no change is planned for the output of coal, a substantial increase is planned for that of lignite, a moderate increase is planned for that of natural gas, and no change is planned for that of crude oil. Because of increasing imports of natural gas and crude oil, the share of coal will decline somewhat in the energy balance, but it will still remain the country's major source of energy.

Among Hungary's fuel and energy resources of lesser importance to the energy economy in 1974 were fuelwood and hydroelectric power. Nuclear power was still in the development stage with construction continuing on the Soviet-assisted Paks nuclear powerplant. The first 440-megawatt unit is scheduled for completion in 1980 and the second in 1981, and further expansion with 1,000-megawatt Leningrad-type units to 4,000 megawatts' capacity is planned for 1990.

As in previous years, the country supplied most of its own fuelwood amounting to about 400,000 tons of standard fuel equivalent in 1974, or 1.2% of the country's energy supply. No fuelwood imports were reported in 1974.

Hungary's hydroelectric generating plants, located on the Tisza River, had about 20,000 kilowatts total capacity. Construction of a 120-megawatt hydroelectric powerplant to be located in the Dömös-

Visegrád area on the Danube River was under consideration.

In 1974, Hungary produced 18.9 billion kilowatt-hours of electricity, 7.4% more than that of 1973. Thermal powerplants generated 18.8 billion kilowatt-hours (99.5%) and hydroelectric powerplants generated 100 million kilowatt-hours (0.5%). Installed capacity of electric powerplants at yearend was about 3.6 million kilowatts; about 432 grams of standard fuel were used per kilowatt-hour generated in 1974. In 1974, industry consumed 39.9% of all coal produced, about 50% of all crude oil, about 95% of all natural gas, and about 69.2% of all electrical energy.

Hungary's primary energy balances for 1973 and 1974 are shown in table 4.

**Table 4.—Hungary: Primary energy balance for 1973 and 1974**
(Million tons standard fuel equivalent)

| Year | Total primary energy | Coal (lignite, brown, bituminous and coke) | Crude oil and petroleum products | Natural and associated gas | Fuelwood | Hydroelectric and other power |
|---|---|---|---|---|---|---|
| 1973: | | | | | | |
| Production | 20.3 | 10.9 | 2.6 | 6.4 | 0.4 | -- |
| Imports | 11.2 | 1.5 | 8.7 | .3 | -- | 0.8 |
| Exports | .8 | -- | .7 | -- | -- | .1 |
| Apparent consumption | 30.7 | 12.4 | 10.6 | 6.7 | .4 | .7 |
| 1974: | | | | | | |
| Production | 20.8 | 11.0 | 2.6 | 6.8 | .4 | -- |
| Imports | 12.5 | 2.4 | 8.9 | .3 | -- | .9 |
| Exports | .7 | -- | .5 | -- | -- | .2 |
| Apparent consumption | 32.6 | 13.4 | 11.0 | 7.1 | .4 | .7 |

[1] Production and trade data for 1973 were from monthly statistical publications, Central Statistics Office (Budapest), 1975, No. 6. Statistical Yearbook 1973, 563 pp., Foreign Trade Yearbook 1974, 465 pp., and other Hungarian sources.

**Coal.**—In 1974, Hungary's 60 underground and 5 open cast mines produced a total of 25.8 million tons of coal, 3.8% less than that of 1973. Of all coal mined in 1974, 3.2 million tons was bituminous coal, a decrease of 5.9% compared with that of 1973; brown coal was 15.3 million tons, a decrease of 1.2%; and lignite 7.3 million tons, a decrease of 8.1%. The target for 1975 is a total coal production of 26.6 million tons.

Of 27.8 million tons of coal available to the economy in 1974, powerplants consumed 16.4 million tons, industry consumed 5.8 million tons, railroads consumed 1.0 million tons, and the remaining 4.6 million tons was consumed by the household sector of the economy.

In July 1974, the coal mining industry employed, about 85,000 persons, 5.3% fewer than those in 1973. In 1973, there were 8,038 accidents in the coal mining industry, 412 less than in 1972; of this total 37 were fatal, 9 more than in 1972. Of 7,160 employees at the Oroszlány coal mines, typical of Hungary's coal industry, 613 were professionals, 337 were office workers, and 5,680 were blue-collar workers. Production at Oroszlány was 2.64 million tons of raw coal in 1974.

There were 25% fewer underground mines and output per mine was 15% more in 1974 than at the beginning of the fourth 5-year plan in 1971. About 44% of coal production and 70% of loading in the mines was mechanized; mechanization of drifting was not satifactory.[11] There was a series of equipment failures at the Visonta lignite mines in 1974, brought about by floods and rain, that caused a 50% drop in coal production and failure to reach production targets for 1974.[12]

In 1974, the average heating value of all coal mined in Hungary was 2,978 kilocalories per kilogram, 0.5% higher than that of 1973; that of lignite was about 1,700 kilocalories per kilogram; that of brown coal ranged from 2,300 to 4,500 kilocalories per kilogram; and that of bituminous coal averaged 4,400 kilocalories per kilogram.

Of Hungary's total geological coal reserves of 5.8 billion tons in 1973, about 5 billion were considered minable. Of this 435 million tons was bituminous coal in south Hungary, near Pécs; 582 million tons was brown coal in Transdanubia; 431 mil-

[11] Bányászat (Budapest). V. 108, No. 7, July 1975, p. 484.
[12] Népszabadság (Budapest). Nov. 7, 1974, p. 8.

lion tons was brown coal in north Hungary; and 3.5 billion tons was lignite, in both north and west Hungary.[13] Hungary had to supplement coal production by imports amounting to 1,430,000 tons of bituminous coal and anthracite in 1974, 2.8% less than that of 1973; of this Czechoslovakia supplied 570,000 tons, Poland 540,000 tons, and the U.S.S.R. 319,000 tons.

Coke production was about 1,081,000 tons; of this 639,000 tons were oven coke, and about 442,000 tons were gas coke. Coke imports amounted to 1.2 million tons; of this 659,000 tons were from the U.S.S.R.; 284,000 tons from Czechoslovakia, and 257,000 tons from Poland. Fuel briquetes totaling 518,363 tons came from East Germany.

There were some organizational changes in Hungary's coal industry in 1974. The United Hungarian Coal Mining Trust was replaced by the Hungarian Coal Mining Trust. This organization, the largest industrial unit in Hungary, includes nine individual coal mining companies which are the Mecsek, Dorog, Tatabánya, Oroszlány, Közép-Dunántúl, Nógrád, Borsod, Várpalota, and Mátraalja.

Hungary's presently producing coal mines reportedly will be depleted in 1990, when five new underground mines and one opencast mine will start production. The new mines will be located in the Oroszlány, Dorog, Tatabánya, and Borsod coalfields. The opencast mine will be at Bükkábrány, where several hundred million tons of lignite with an average heating value of about 1,650 kilocalories per kilogram have been found. The mine is to produce 20 million to 22 million tons of coal per year for 30 to 35 years and is to supply a 2,000-megawatt minemouth powerplant.

Coal exploration was centered around the Tatabánya coal basin, particularly in the areas of Csordakút, Nagyegyháza, and Mány. Near Csordakút, development of a new mine was begun. Exploration for lignite was centered near the Szombathely area in west Hungary, near the common border of Hungary with Austria.

It was reported that Hungary bought a complete coking plant from India for supplying the Danube steelworks with metallurgical coke.[14]

**Natural Gas.**—During 1974, Hungary produced 180 billion cubic feet of marketable natural gas from 72 gasfields, an increase of 5.7% over that of 1973. In addition, the country produced manufactured gas totaling about 25 billion cubic feet, prepared from coal or hydrocarbons in gasplants at Budapest, Pécs, Baja, Györ, Sopron, Szombathely, and Dunaújváros. As in the past, imports of natural gas from Romania remained around the 7-billion-cubic-foot-per-year level. Construction of the U.S.S.R.-Lenin City natural gas pipeline entered its last phase; the pipeline is to carry 1.2 billion cubic meters of natural gas from the U.S.S.R. to Hungary in 1975, and 4 billion cubic meters in 1980. Capacity of the pipeline is 10 billion cubic meters of gas per year. Hungary's estimated recoverable natural gas reserves at yearend amounted to 45 billion cubic meters.[15] This includes 3.1 million tons of liquid natural gas, 3.5 million tons of stabilized gasoline, 400,000 tons of isopentane, and 800,000 tons of other liquid hydrocarbons contained in the gas.

Exploration for oil and natural gas was performed mainly by 13 seismic groups. About 5% of all natural gas produced in the country in 1974, was associated gas.[16]

Work continued on construction of the natural gas processing plant at the Algyö gasfields. The first stage of the plant is to start production in 1975; yearly output will include 170,000 tons of liquid natural gas, 200,000 tons of gasoline, and 20,000 tons of isopentane. Design and engineering is by the Kiev-based designing institute of the Soviet gas industry.

Seven underground gas storage facilities are to enter service between 1976 and 1980, for a total hourly capacity of 440,000 cubic meters. There is to be one each at Szeged and Kardoskút, two at Hajduszoboszló, and three at Pusztaszederics.

**Petroleum.**—Total production of crude oil in 1974 amounted to 1,997,000 tons, an increase of 0.4% over that of 1973. Of crude oil imports totaling 6,817,000 tons in 1974, 262,000 tons more than that of 1973, the U.S.S.R. supplied 6,126,000 tons, Iraq 583,000 tons, Albania 55,000 tons, and Egypt 53,000 tons. Imports of petroleum products totaled 1,042,545 tons, including 836,527 tons from the U.S.S.R., 44,464 tons from Romania, 39,946 tons from Austria, and 20,216 tons from Kuwait.

In 1974, the Algyö oilfield supplied more

[13] Bányászat (Budapest). V. 107, No. 8, August 1974, p. 587.
[14] Glückauf (Frankfurt). V. 111, No. 4, April 1975 p. 140.
[15] Koolaj és Foldgáz (Budapest). V. 7, No. 11, November 1974, p. 333.
[16] Koolaj és Foldgáz (Budapest). V. 8, No. 4, April 1975, p. 100.

than half of the country's crude oil production; the remainder came from 20 smaller oilfields. There were about 900 oilwells in 1974, producing oil from estimated reserves of about 19 million tons.[17] Conditions for producing crude oil were difficult. Water in quantities up to 12 times that of the oil produced had to be injected into the formations at the Nagylengyel oilfields; 54% of the wells had to be pumped, and average production per day was 2.2 tons, per well; when gas injection was used, production was lower.[18] At present it is not expected that the country's crude oil production can be further significantly increased.

Oil drilling was 279,300 meters in 1974, 17.8% more than that of 1973. The cost of drilling was about $250 per meter, and an average of 22.5 drilling rigs were in operation during 1974. Cost of exploration reportedly totaled about $8.82 per ton of crude oil produced.

Hungary's total refining capacity was 10 million tons in 1974; of this 7 million tons were at the Danube oil refinery, 2 million tons at the Komárom oil refinery, 700,000 tons at the Zala oil refinery, and 300,000 tons at the Nyirbogdány oil refinery. Additional refining capacity was under construction at the Tisza chemical works and at the Danube oil refinery, and reconstruction of the Komárom oil refinery was scheduled for 1975. Hungary's catalytic reforming capacity was 1 million tons.

Crude oil from the U.S.S.R. came by the Friendship I and II pipelines. The Friendship I stretches from Sahy in Czechoslovakia to Százhalombatta in Hungary and carries 4.5 million tons per year. The Friendship II stretches from Uzhorod in the U.S.S.R. to Százhalombatta via Leninváros in Hungary, and has a 10-million-ton-per-year capacity. Other pipelines interconnect the oilfields of Transdanubia, the Szeged area, and the Százhalombatta refinery.

Construction has started on the Adria pipeline which will carry Midwestern and African crude oil from the Adriatic sea to Yugoslavia, Hungary, and Czechoslavakia by 1977. One terminal of the pipeline is on the Adriatic Island of Krk where construction of a harbor for supertankers has already started. The main 40-inch-diameter line is to extend from the terminal to Sisak in Yugoslavia, where 28-inch lines branch out to other Yugoslavian refineries, and to Hungary, which the pipeline enters at Csurgó. In Hungary the line extends to Százhalombatta which is to receive 5 million tons of crude oil per year. The remaining 5 million tons of crude oil carried by the line are to be pumped each year to Czechoslovakia by using the older Friendship I pipeline extending from Százhalombatta to Sahy. Both Hungary and Czechoslovakia are to contribute $25 million to Yugoslavia for the construction of the Yugoslavian section of the pipeline, but sections of the pipeline across each country are to be built by the respective country itself.

In the petrochemical industry, construction of the $30-million petrochemical combine in Lenin City, near Tiszalök, was almost completed and trial runs started at yearend 1974. Some of the ethylene produced in this plant will be pumped by a 330-kilometer pipeline to the chemical combine in Kalush, the U.S.S.R., and some of it will be piped to the Borsod chemical combine in Hungary. The Borsod chemical combine, near Kazincbarcika, the construction of which continued in 1974, will produce 150,000 tons of polyvinylchloride, 110,000 tons of chlorine, and 125,000 tons of caustic soda. The vinylchloride plant will be supplied by the English subsidiary of the Badger Co., the polymer plant by the Japanese Sin Etsu Co., and the alkalichloride electrolysis plant by the Italian De Nora Co.

**Nuclear Energy.**—In 1974, work continued on the construction of Hungary's first nuclear powerplant on the west bank of the Danube River, 120 kilometers south of Budapest at Paks. About $50 million have been spent preparing the plantsite. Engineering, construction, and most of the equipment will come from the U.S.S.R. The first of four 440-megawatt Novovoronesh-type reactor blocs is scheduled to start operating in January 1980, the second in 1981, the third in 1983, and the fourth in 1984, with the 4,000-megawatt level reached by 1990, using 1,000-megawatt Leningrad-type units.

Hungary's uranium mining continued in the Pécsszöllös area with the opening of a new seam at the No. 4 mine of the Mecsek ore mining enterprise. Temperatures as high as 117° F made use of air conditioning at the mine necessary.

[17] Köolaj és Foldgáz (Budapest). V. 8, No. 4, April 1975, p. 102.
[18] Figyelö (Budapest). V. 18, No. 26, June 26, 1974, p. 6.

# The Mineral Industry of India

By Louis J. Sousa [1]

The performance of India's mineral industry showed little improvement during 1974 as gains in the production of coal, petroleum, natural gas, copper, zinc, phosphate rock, fertilizers, and limestone were offset by declines in the output of iron and manganese ores, pig iron and steel, bauxite, aluminum, and cement.

The increase in coal production was probably one of the most significant improvements. Coking coal shortages early in the year were largely responsible for the decline in steel mill capacity utilization and hence steel production. Electric power cutbacks, caused at least partially by inadequate coal supplies, tended to inhibit output of all industrial activities most notably large power using or dependent industries such as aluminum, steel, and underground coal mining. As the coal supply position improved during the year, both steel production and electric power generation advanced. Overall coal production increased 7% over that of 1973 to 86.3 million tons.

Production of the other major fossil fuels also improved slightly. Gross natural gas production was up 14%, while production of both crude and refined petroleum products increased 1%. Additionally, increased offshore exploration efforts proved the existence of substantial high-quality commercially exploitable petroleum reserves off India's west coast in the Bombay High area.

The performance of India's ferrous metal industries, though down somewhat from that of 1973, nonetheless showed a gradual improvement through the latter half of the year. Iron ore and manganese ore production were both down 1%. Steel ingot production dropped 13% to 6 million tons. The output of the country's electric arc furnace "mini" mills was exceptionally low as production reached only 25% of capacity.

India's production of bauxite and aluminum was particularly affected by the electric power shortages with respective declines of 14% to 16% registered, while output of India's other major nonferrous metals, copper, lead, and zinc, all showed dramatic improvements over that of 1973. On a metal content basis, production of copper and lead ores were both up 38%, while zinc ore output increased 26%.

The performance of India's principal nonmetallic mineral commodities was mixed. Cement production declined 5% while limestone output increased a percentage point. Although phosphate rock production more than tripled during the year, output totaled less than half a million tons.

Indian fertilizer production improved slightly, but output of 1.1 million tons (nitrogen and phosphorus pentoxide content) was far below total capacity and estimated demand. Rather than continue to meet domestic demand through the purchase of increasingly expensive petroleum-based fertilizer imports, India placed more emphasis on developing fertilizer plants using coal as a feedstock, a fuel in which its reserves are abundant.

The performance of all of India's mineral industries was largely affected by conditions in two vital components of the country's industrial infrastructure—the electric power industry and the rail transport industry. Although total electricity generated increased in 1974 to 63.4 billion kilowatt-hours, per capita consumption was among the world's lowest at 113 kilowatt-hours, less than one-tenth the world aver-

[1] Economist, Division of Ferrous Metals.

age. Light monsoons caused shortages in hydroelectric power output while poor quality and irregular supplies of coal contributed to thermal stations operating at only 40% of capacity. Additionally, large power consumers frequently had portions of their supply diverted to agricultural operations.

Overall rail traffic (measured by the number of cars loaded) improved 1% over that of 1973. Significantly, the number of railcars carrying coal or coke increased 7% over that of 1973 and accounted for about one-third of total rail traffic. The improvement in coal transport was an important factor in getting maximum utilization of the increased coal supplies.

India's foreign trade in mineral commodities was disappointing in 1974. Iron ore exports, the principal mineral export, changed little from that of 1973, while value of imports of crude oil, refined petroleum products, and manufactured fertilizers increased substantially over that of 1973. The effects of these imports on the country's trade balance was slightly mitigated, however, by such agreements as deferred payment plans and barter arrangements. Through belt-tightening measures, India managed to greatly reduce its volume of imports of these materials during the last few months of the year.

The Government of India continued to increase its involvement in the ownership and operation of the country's mineral industries during the year. The Government acquired 74% ownership in Exxon Corp.'s Indian operations and conducted negotiations aimed at securing similar agreements with the two remaining foreign-based private oil companies in the country. The Government also moved to gain greater control over the export of mica by forming the Mica Trading Corp. of India. Additionally, there were reports that the Government's Minerals and Metals Trading Corporation (MMTC) was considering "canalizing" exports of Goan iron ore. Iron ore exported from Goa is sold under agreements negotiated by private businessmen. If the MMTC moves to canalize Goan exports, the terms of sales agreements would become subject to government approval and control.

In summary the Indian mineral industry showed neither a definite positive improvement nor negative decline during 1974. However, when viewed in the context of rampant inflation, massive food shortages, and the high unemployment which the country experienced, the fact that the mineral industry was able to hold steady may itself have been a sign of underlying strength. At yearend, however, it was questionable as to how long the situation in the minerals industry could remain stable in the face of such potentially destabilizing conditions.

## PRODUCTION

With the exception of aluminum, cement, and some ferrous group minerals, production of practically all principal mineral commodities in India increased during 1974 over that of 1973. In the ferrous group iron ore output dropped 1% to 35,306,000 tons while pig iron production declined to 6,627,000 tons. Production of ingot steel also declined during the year to 5,986,000 tons, a drop of 13% from that of 1973. Manganese ore production fell for the third straight year to 1,474,000 tons. One bright spot among the ferrous metals was chromite production which increased 36% to 393,718 tons.

**Table 1.—India: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| **METALS** | | | | |
| Aluminum: | | | | |
| Bauxite, gross weight | thousand tons | 1,684 | 1,292 | 1,113 |
| Alumina, gross weight [e] | do | 363 | 314 | 263 |
| Metal, primary only | | 179,103 | 154,266 | 128,913 |
| Antimony metal, regulus | | 894 | 517 | 393 |
| Beryllium, beryl, gross weight [2] | | NA | NA | NA |
| Cadmium metal | | 34 | 33 | 59 |
| Chromium, chromite, gross weight | | 294,500 | 290,537 | 393,718 |

See footnotes at end of table.

## Table 1.—India: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| METALS—Continued | | | |
| Copper: | | | |
| Mine output, metal content | 12,744 | 14,592 | 20,100 |
| Metal: | | | |
| Smelter | 10,467 | 10,950 | 11,000 |
| Refined | 10,500 | 12,011 | 11,782 |
| Gold, smelter ... troy ounces | 105,776 | 105,390 | 101,114 |
| Iron and steel: | | | |
| Iron ore and concentrate, gross weight ... thousand tons | 35,476 | 35,562 | 35,306 |
| Pig iron ... do | r 7,207 | 7,369 | 6,627 |
| Ferroalloys: | | | |
| Ferrochrome | r 1,524 | 6,633 | 15,088 |
| Ferromanganese | r 160,763 | 141,063 | 145,599 |
| Ferrosilicon | r 31,509 | 24,269 | 30,468 |
| Other | r 2,758 | 2,164 | 1,570 |
| Steel ingots ... thousand tons | 6,842 | 6,882 | 5,986 |
| Steel castings ... do | 90 | 84 | 68 |
| Steel semimanufactures: | | | |
| Angles, shapes, sections ... do | 879 | 685 | NA |
| Bars and rods ... do | 1,831 | 1,982 | NA |
| Plates and sheets: | | | |
| Uncoated ... do | 642 | 587 | NA |
| Galvanized ... do | 154 | 155 | NA |
| Tinplate ... do | 120 | 84 | NA |
| Hoop, strip, skelp ... do | 466 | 472 | NA |
| Rails and accessories ... do | 452 | 365 | NA |
| Wire ... do | 231 | 286 | NA |
| Special steels, form not specified ... do | 164 | 235 | NA |
| Total ... do | 4,939 | 4,851 | 4,805 |
| Lead: | | | |
| Mine output, metal content | r 3,700 | 6,643 | 9,147 |
| Metal, primary only | 2,740 | 2,636 | 3,986 |
| Manganese ore and concentrate, gross weight ... thousand tons | 1,642 | 1,489 | 1,474 |
| Rare-earth metals, monazite concentrate, gross weight [e] | 4,086 | 3,500 | 3,000 |
| Silver, mine and smelter output ... thousand troy ounces | 142 | 137 | 147 |
| Titanium: | | | |
| Ilmenite concentrate, gross weight | 91,070 | 77,191 | e 77,000 |
| Rutile concentrate, gross weight | 3,065 | 3,400 | e 3,400 |
| Tungsten, mine output, metal content | 17 | 13 | 12 |
| Zinc: | | | |
| Mine output, metal content | r 9,600 | 15,327 | 19,257 |
| Metal | 25,227 | 12,506 | 21,105 |
| Zircon [e] | r 5,000 | 6,200 | 6,200 |
| NONMETALS | | | |
| Abrasives, natural, n.e.s: | | | |
| Corundum, natural | 391 | 266 | 335 |
| Garnet | 3,235 | 2,741 | 3,680 |
| Asbestos | 12,359 | 12,460 | 21,216 |
| Barite | 48,348 | 118,294 | 139,521 |
| Cement, hydraulic ... thousand tons | 15,700 | 15,000 | 14,265 |
| Chalk | 60,053 | 65,652 | 54,567 |
| Clays: | | | |
| Ball clay | 17,491 | 17,483 | 22,489 |
| Diaspore | 5,198 | 7,940 | 3,076 |
| Fire clay | 722,000 | 718,000 | 787,000 |
| Kaolin (china clay): | | | |
| Direct salable crude | 288,000 | 274,000 | 312,000 |
| Processed [3] | 117,000 | 100,000 | 110,000 |
| Total salable | r 405,000 | 374,000 | 422,000 |
| Other | 142,000 | 198,000 | 229,000 |
| Diamond: | | | |
| Gem [e] ... thousand carats | 17 | 18 | 18 |
| Industrial [e] ... do | 3 | 3 | 3 |
| Total ... do | 20 | 21 | 21 |
| Diatomite | NA | 81 | 50 |
| Feldspar | 52,801 | 42,802 | 52,061 |
| Fertilizer materials: | | | |
| Crude, phosphatic: | | | |
| Apatite | 11,613 | 9,980 | 11,971 |
| Phosphate rock | 216,693 | 136,512 | 433,545 |
| Manufactured: | | | |
| Nitrogenous, nitrogen content [4] ... thousand tons | r 896 | 924 | 964 |
| Phosphatic, $P_2O_5$ content [5] ... do | r 124 | 122 | 124 |

See footnotes at end of table.

## Table 1.—India: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fluorspar, all grades | 3,301 | 2,951 | 3,893 |
| Gem stones, excluding diamond: | | | |
| Agate (including chalcedony pebble) | 798 | 1,104 | 1,030 |
| Emerald, crude carats | 21,370 | 3,365 | 2,615 |
| Garnet kilograms | 1,883 | 810 | 346 |
| Gypsum thousand tons | 1,105 | 886 | 1,073 |
| Kyanite and related materials: | | | |
| Kyanite | 67,897 | 58,215 | 45,279 |
| Sillimanite | 4,046 | 3,138 | 2,917 |
| Lime | 338,000 | 428,000 | 377,000 |
| Magnesite | 251,000 | 193,000 | 265,797 |
| Mica: | | | |
| Crude (reported output total, actual production exceeds this quantity) | r e 18,000 | 18,937 | 18,232 |
| Processed: | | | |
| Exports: | | | |
| Blocks | 1,484 | 1,018 | 940 |
| Splittings | r 6,230 | 5,465 | 6,172 |
| Condenser films | r 175 | 121 | 175 |
| Washers and discs | 103 | 230 | 198 |
| Waste and scrap | 14,350 | 14,410 | 18,952 |
| Powder | 2,996 | 7,010 | 9,080 |
| Micanite and other built-up mica | 17 | 16 | 21 |
| Other | -- | 42 | 10 |
| Total | 25,355 | 28,312 | 35,548 |
| Domestic use e | 8,500 | 9,600 | 10,500 |
| Grand total | 33,855 | 37,912 | 46,048 |
| Pigments, natural mineral, ocher | 67,409 | 53,560 | 78,666 |
| Pyrite: | | | |
| Gross weight | 30,723 | 41,507 | 35,660 |
| Sulfur content | 11,370 | 15,360 | 13,200 |
| Salt, all types thousand tons | 6,520 | 6,936 | 5,208 |
| Stone, sand and gravel: | | | |
| Calcite | 28,633 | 23,867 | 23,622 |
| Dolomite thousand tons | 1,348 | 1,449 | 1,202 |
| Limestone do | 25,946 | 25,341 | 25,607 |
| Quartz and quartzite do | 330 | 319 | 322 |
| Sand, calcareous do | 960 | 1,004 | 729 |
| Sand, other do | 1,345 | 1,458 | 1,431 |
| Slate | 1,114 | 1,088 | 943 |
| Talc and related materials: | | | |
| Pyrophyllite | 15,036 | 14,912 | 14,842 |
| Steatite (soapstone) | 211,000 | 210,000 | 269,000 |
| Vermiculite | 1,541 | 2,709 | 2,820 |
| Wollastonite | 3,326 | 476 | 947 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black e | 40,000 | 45,000 | 65,000 |
| Coal: | | | |
| Bituminous thousand tons | 74,771 | 77,870 | 83,265 |
| Lignite do | 3,067 | 3,320 | 3,019 |
| Total do | 77,838 | 81,190 | 86,284 |
| Coke: | | | |
| Coke oven and beehive do | r 9,051 | 8,898 | e 9,352 |
| Gashouse do | 79 | 55 | e 49 |
| Other soft do | r 3,374 | 3,557 | e 3,667 |
| Total do | 12,504 | 12,510 | e 13,068 |
| Gas, natural: | | | |
| Gross production million cubic feet | 55,224 | 59,124 | 67,716 |
| Marketable production [6] do | r 32,716 | 32,220 | 35,660 |
| Petroleum: [7] | | | |
| Crude oil thousand 42-gallon barrels | 56,965 | 55,388 | 55,733 |
| Refinery products: | | | |
| Gasoline e do | r 13,836 | 14,870 | 10,965 |
| Jet fuel and kerosine e do | r 22,138 | 28,768 | 22,367 |
| Distillate fuel oil e do | r 42,509 | 45,558 | 53,100 |
| Residual fuel oil e do | r 24,968 | 29,321 | 28,258 |
| Lubricants e do | r 4,565 | 4,641 | 2,772 |

See footnotes at end of table.

Table 1.—India: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Petroleum—Continued | | | | |
| Refinery products—Continued | | | | |
| Other [e] | thousand 42-gallon barrels | [r] 29,341 | 16,747 | 23,610 |
| Refinery fuel and losses | do | [r] 5,965 | 9,711 | 7,173 |
| Total | do | 143,322 | 149,616 | 148,245 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to the commodities listed, India also produces bromine, other clays (bentonite, fuller's earth, and common clay), other varieties of gem stones (aquamarine, ruby and spinel), uranium and natural graphite, but production data are not available.
[2] Apparently, production of industrial beryl has been terminated in India, with remaining output being confined to insignificant unreported quantities produced as a byproduct of mica production and relatively inconsequential output of gem quality material. No beryl has been reported among exports from India since 1967.
[3] In 1972, 341,000 metric tons of "nonsalable" crude kaolin was processed to provide 117,000 metric tons of "processed" kaolin produced; comparable nonsalable crude clay figures are not available for 1973 and 1974.
[4] Nitrogen content of ammonium sulfate, nitrophosphate and urea.
[5] $P_2O_5$ content of superphosphates only.
[6] Includes reinjected.
[7] Details on refinery production by product type are not available; estimates supplied are based on available information on refinery facilities. Data on refinery fuel and losses and on total refinery throughput are reported.

Of the nonferrous metals, the output of copper, lead, and zinc advanced while aluminum and bauxite production declined. Copper mine production climbed 38% to 20,100 tons of metal contained in ore while refined copper metal output decreased 2% to 11,782 tons. Mine production of lead ore increased to 9,147 tons of contained lead, while production of refined lead also increased to 3,986 tons. Zinc ore and metal both showed healthy production increases over those of 1973 with mine output climbing 26% to 19,257 tons of contained zinc and slab zinc production increasing 69% to 21,105 tons. Due principally to massive electric power cutbacks, aluminum output was the major disappointment among the nonferrous metals declining 16% to 128,913 tons. This in turn affected the demand for and mining of bauxite which fell 14% to 1,113,000 tons.

The largest percentage increase in mineral production over that of 1973 occurred in phosphate rock output which more than tripled to 433,545 tons. Of the other major nonmetals produced in India, limestone production increased 1% to 25,607,000 tons, crude mica production decreased 4% to 18,232 tons, while cement production fell slightly to 14,265,000 tons, a 5% drop from that of 1973.

In the fossil fuels group, coal, petroleum, and natural gas production all advanced over that of 1973. Coal and lignite output increased 7% to 86.3 million tons, gross natural gas production climbed 14% to 67,716 million cubic feet, and production of crude petroleum increased 1% to 55.7 million barrels. Output of refined petroleum products (excluding refinery fuel and losses) also advanced a percentage point to 141.1 million barrels.

## TRADE

Based on a conversion rate of 8 rupees per dollar, the total value of India's exports was $3.8 billion.[2] Of the total, India's mineral industries accounted for $618 million, or about 16%. The two largest export categories were metallic ores and scrap, and nonmetallic mineral manufactures. A total of $214 million was earned from exports of metallic ores and scrap during the year. This included $171 million earned from the export of 21.9 million tons of iron ore and concentrate, and $7.7 million for 1,036,075 tons of manganese concentrate. Approximately $161 million was earned from the export of nonmetallic mineral manufactures during 1974. This included the export of diamonds worth $118 million.

The total value of imports was $5.2 bil-

[2] Where necessary, values have been converted from India rupee (Rs) to U.S. dollars at the rate of Rs8=US$1.00.

lion during 1974. Imports of mineral industry materials and goods amounted to $2.7 billion, or about 52% of total imports. The high cost of petroleum was the largest factor in India's trade deficit with imported crude oil totaling $1.2 billion, and petroleum products costing $272 million. Payments for petroleum represented about 28% of total imports. Other large import costs resulted from the purchase of iron and steel valued at $474 million, manufactured fertilizers valued at $343 million, and nonferrous metals valued at $223 million.

**Table 2.—India: Exports and reexports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1973 | 1974 |
|---|---|---|
| **METALS** | | |
| Aluminum: | | |
| Bauxite | 28,494 | 18,264 |
| Aluminum oxide and hydroxide | 37 | 32,744 |
| Metal and alloys: | | |
| Unwrought | 6 | 26 |
| Semimanufactures | 5,887 | 4,969 |
| Antimony ore and concentrate | 81 | -- |
| Cadmium metal including alloys, all forms | -- | 10 |
| Chromium ore and concentrate | 221,243 | 334,364 |
| Copper: | | |
| Copper sulfate | 1 | 6 |
| Metal and alloys: | | |
| Unwrought | 102 | 2 |
| Semimanufactures | 4,564 | 2,447 |
| Iron and steel: | | |
| Iron ore[1] thousand tons | 20,830 | 21,309 |
| Iron ore concentrate do | 455 | 591 |
| Scrap do | 124 | 97 |
| Pig iron, shot, pellets do | 563 | 127 |
| Ferroalloys: | | |
| Ferrochrome | 917 | 4,767 |
| Ferromanganese | 46,430 | 32,961 |
| Ferrosilicon | 989 | 2,006 |
| Steel ingots and equivalent primary forms thousand tons | 13 | 4 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections do | 39 | 45 |
| Plates and sheets do | 8 | 5 |
| Hoop and strip do | (2) | (2) |
| Rails and accessories do | 19 | 11 |
| Wire do | 1 | 2 |
| Pipes, tubes, and fittings do | 102 | 148 |
| Castings and forgings, rough do | 1 | 4 |
| Lead: | | |
| Oxides | 355 | 627 |
| Metal and alloys, all forms | 133 | 36 |
| Manganese ore and concentrate: | | |
| First grade ore | 25,148 | 96,175 |
| Second grade ore | 203,735 | 208,454 |
| Ferruginous manganese ore[3] | 462,015 | 729,974 |
| Peroxide ore, below 86% $MnO_2$ | 1,000 | -- |
| Manganese sludge | 250 | -- |
| Manganese oxide | 1,047 | 1,472 |
| Molybdenum metal, all forms kilograms | 15 | 28 |
| Nickel: | | |
| Matte | 1 | 2 |
| Metal including alloys, all forms | -- | 13 |
| Selenium, elemental kilograms | 22 | -- |
| Silicon, elemental do | 200 | -- |
| Silver metal including alloys thousand troy ounces | -- | 15,221 |
| Tin metal including alloys, all forms long tons | 171 | 61 |
| Titanium ore and concentrate, ilmenite | 75,055 | 118,634 |
| Tungsten metal, all forms kilograms | 18 | 16 |
| Zinc: | | |
| Oxide | 5,155 | 964 |
| Metal including alloys, all forms: | | |
| Scrap | -- | (2) |
| Dust | 123 | -- |
| Unwrought and semimanufactures | 247 | 1 |
| Other: | | |
| Ores and concentrates: | | |
| Of rare-earth metals | 1 | 1 |
| Of vanadium, molybdenum, columbium, tantalum, zirconium | 12,861 | 8,732 |
| Other, n.e.s | -- | 540 |
| Oxides and hydroxides, n.e.s | 1,519 | 317 |
| Metal-bearing residues | 258 | 940 |
| Base metals including alloys, all forms, n.e.s | -- | 339 |

See footnotes at end of table.

## Table 2.—India: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1973 | 1974 |
|---|---|---|---|
| **NONMETALS** | | | |
| Abrasives: | | | |
| Natural emery, crude | | -- | 59 |
| Natural, n.e.s | | 345 | 27 |
| Natural or synthetic dust and powder of gem stones, except diamond | | -- | (2) |
| Abrasive wheels, stones and powder | | 1,419 | 1,403 |
| Asbestos | | 22 | 11 |
| Barite and witherite | | 34,593 | 145,078 |
| Boron materials: | | | |
| Borates, crude natural | | 2 | -- |
| Boric acid | | 560 | 231 |
| Bromine, elemental | kilograms | 150 | -- |
| Cement, hydraulic | | 261,280 | 198,020 |
| Chalk | | 162 | 129 |
| Clays and clay products (including all refractory brick): | | | |
| Crude: | | | |
| Ball clay | | 54 | 414 |
| Bentonite | | 5,752 | 11,602 |
| Earth clay | | 3 | 1 |
| Fire clay | | 2,297 | 143 |
| Fuller's earth | | 4 | 59 |
| Kaolin | | 759 | 3,239 |
| Other, n.e.s. | | 166 | 407 |
| Products: | | | |
| Refractory (includes nonclay refractory products) | | 4,576 | 6,442 |
| Nonrefractory | | r989 | r1,363 |
| Diamond, gem: | | | |
| Uncut | value, thousands | $2,138 | $13,205 |
| Cut | do | $90,569 | $104,570 |
| Feldspar | | 8,662 | 9,600 |
| Fertilizer materials: | | | |
| Manufactured: | | | |
| Nitrogenous | | 7,250 | -- |
| Potassic | | 110 | -- |
| Ammonia, anhydrous and aqueous | value | $461 | $7,526 |
| Gem stones except diamond: | | | |
| Natural: | | | |
| Uncut: | | | |
| Emerald | value, thousands | $924 | $856 |
| Feldspar | do | $6 | $44 |
| Other | do | $3,314 | $4,721 |
| Cut | do | $16,291 | $18,640 |
| Synthetic and reconstituted: | | | |
| Uncut | do | $917 | $59 |
| Cut | do | $18 | $88 |
| Graphite, natural | | 150 | 176 |
| Gypsum and plasters | | -- | 8,144 |
| Kyanite and related materials: | | | |
| Kyanite, calcined | | 9,141 | 6,564 |
| Kyanite, other | | 15,951 | 18,595 |
| Sillimanite | | 1,003 | 829 |
| Other | | 512 | 191 |
| Lime, quicklime, hydraulic lime | | 4,920 | 2,784 |
| Magnesite: | | | |
| Crude | | 109 | 498 |
| Calcined, excluding dead-burnt | | 14,107 | 15,416 |
| Dead-burnt | | 181 | 15 |
| Mica: | | | |
| Crude: | | | |
| In blocks | | 944 | 940 |
| Condenser film | | 158 | 137 |
| Splittings | | 5,279 | 6,106 |
| Scrap and waste | | 14,410 | 18,952 |
| Powder | | 1,903 | -- |
| Manufactured: | | | |
| Condenser film plates | | 11 | 37 |
| Washer discs | | 23 | 197 |
| Cut sheets and strips | | 86 | 68 |
| Micanite and other built up | | 16 | 21 |
| Powder | | 5,107 | 9,081 |
| Other | | 43 | 9 |
| Pigments, mineral: | | | |
| Natural, not further described | | 611 | 631 |
| Iron oxide | | 2,776 | 9,064 |
| Salt | | 256,121 | 230,502 |

See footnotes at end of table.

## Table 2.—India: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1973 | 1974 |
|---|---|---|
| NONMETALS—Continued | | |
| Sodium and potassium compounds, n.e.s.: | | |
| Caustic soda | 470 | 1,755 |
| Caustic potash | 962 | 921 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude and partly worked: | | |
| Slate | 78 | 182 |
| Marble | 605 | 162 |
| Other | 61,701 | 166,748 |
| Worked, all types | 2,102 | 5,020 |
| Crushed stone, broken stone, and gravel: | | |
| Dolomite | 8,733 | 4,446 |
| Limestone for lime manufacture | 71,534 | 60,727 |
| Quartz | 3,158 | 5,892 |
| Other | 35 | 336 |
| Sand, excluding metal bearing | 182 | 26,394 |
| Sulfur: | | |
| Elemental | 1,263 | 411 |
| Sulfuric acid | 756 | 2,796 |
| Talc, steatite, soapstone | 10,106 | 11,566 |
| Other: | | |
| Crude | 923 | 689 |
| Slag and wastes, not metal bearing | 11,670 | 19,971 |
| Oxides and hydroxides of strontium, barium, magnesium | 81 | 251 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Asphalt and bitumen, natural | 5,615 | 150 |
| Carbon black | 4,208 | 7,634 |
| Coal: | | |
| Anthracite | 1,485 | -- |
| Bituminous | 490,991 | 388,769 |
| Coke | 17,782 | 14,791 |
| Petroleum: | | |
| Crude thousand 42-gallon barrels | 6,859 | -- |
| Refinery products: | | |
| Gasoline do | 244 | 331 |
| Kerosine and jet fuel do | 475 | 1,051 |
| Distillate fuel oil do | 416 | 229 |
| Residual fuel oil do | 12 | (2) |
| Lubricants do | 14 | 9 |
| Other do | 18 | 1 |
| Total do | 1,179 | 1,621 |
| Crude chemicals produced from the distillation of coal, oil, and/or natural gas | 3 | 35,535 |

[1] Including manganiferrous iron ore containing up to 10% Mn.
[2] Less than ½ unit.
[3] Grade: 10%–35% Mn.
[4] Partial figure; excludes materials not reported quantitatively valued at $18,681 in 1973 and $95,220 in 1974.

## Table 3.—India: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1973 | 1974 |
|---|---|---|
| METALS | | |
| Aluminum: | | |
| Alumina | 487 | 519 |
| Metal and alloys, all forms | 1,282 | 1,278 |
| Antimony: | | |
| Ore and concentrate, gross weight | 1,240 | 717 |
| Oxides | 38 | 39 |
| Metal and alloys, all forms | 26 | 1 |
| Arsenic: | | |
| Crude sulfides | 4 | 2 |
| Oxide and acid | 638 | 699 |
| Elemental | 77 | 141 |
| Beryllium metal and alloys, all forms kilograms | 10 | 961 |
| Bismuth metal and alloys, all forms | 15 | 8 |
| Cadmium: | | |
| Oxide | 10 | (1) |
| Metal and alloys, all forms | 46 | 4 |

See footnotes at end of table.

## Table 3.—India: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1973 | 1974 |
|---|---|---|
| METALS—Continued | | |
| Chromium: | | |
| Oxide and hydroxide | -- | (1) |
| Metal and alloys, all forms | 50 | 37 |
| Cobalt: | | |
| Oxides and hydroxide | 17 | 15 |
| Metal and alloys, all forms | 179 | 203 |
| Copper metal and alloys: | | |
| Scrap | 30 | 28 |
| Unwrought | 50,708 | 38,175 |
| Semimanufactures | 4,434 | 2,368 |
| Iron and steel: | | |
| Iron ore | 275 | 322 |
| Scrap | 21,108 | 12,013 |
| Pig iron, sponge iron, iron and steel powder | 742 | 672 |
| Ferroalloys | 415 | 1,037 |
| Steel ingots and equivalent primary forms | 45,594 | 18,246 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections | 137,060 | 217,498 |
| Sheets and plates | 684,881 | 864,706 |
| Hoop and strip | 74,461 | 48,400 |
| Rails and accessories | 2,706 | 8,408 |
| Wire | 8,950 | 9,880 |
| Pipes, tubes, fittings | 52,489 | 56,291 |
| Castings and forgings, rough | 6,466 | 9,051 |
| Lead: | | |
| Ore and concentrate | 28 | 18 |
| Oxide | 5 | 38 |
| Metal: | | |
| Unwrought | 65,326 | 38,805 |
| Semimanufactures | 552 | 106 |
| Magnesium metal and alloys, all forms | 397 | 330 |
| Manganese: | | |
| Ore and concentrate | 4,123 | 2,776 |
| Oxides | 201 | 232 |
| Metal and alloys | 329 | 24 |
| Mercury 76-pound flasks | 6,881 | 9,898 |
| Molybdenum metal and alloys, all forms | 17 | 67 |
| Nickel: | | |
| Ore and concentrate | (1) | -- |
| Matte | 1 | 96 |
| Metal and alloys: | | |
| Scrap | 506 | 98 |
| Unwrought | 677 | 1,677 |
| Semimanufactures | 1,798 | 2,396 |
| Platinum and silver: | | |
| Waste and scrap | 8 | -- |
| Platinum metal, unwrought and semimanufactures troy ounces | 16,979 | 16,156 |
| Silver metal, unwrought and semimanufactures do | 17,856 | 14,558 |
| Selenium, elemental | 17 | 13 |
| Silicon, elemental | 1,068 | 947 |
| Tantalum metal and alloys, all forms kilograms | 335 | 125,030 |
| Tin: | | |
| Oxide long tons | 21 | 9 |
| Metal and alloys: | | |
| Scrap do | 2,070 | 388 |
| Unwrought do | 2,690 | 1,740 |
| Semimanufactures do | 2 | 3 |
| Titanium oxide | 10,516 | 7,416 |
| Tungsten: | | |
| Ore and concentrate | 276 | 203 |
| Metal, all forms | 10 | 9 |
| Zinc: | | |
| Ore and concentrate | 34,751 | 10,321 |
| Oxide | 2 | 6 |
| Dust | 1,841 | 465 |
| Metal and alloys: | | |
| Unwrought | 63,228 | 64,699 |
| Semimanufactures | 706 | 79 |
| Other: | | |
| Ores and concentrates of vanadium, molybdenum, columbium, tantalum, zirconium | 8 | 4 |
| Scrap and other wastes, n.e.s | 1 | 1 |
| Metalloids, n.e.s | 90 | 46 |
| Metals, unwrought and semimanufactures, n.e.s | 154 | 87 |

See footnotes at end of table.

## Table 3.—India: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1973 | 1974 |
|---|---|---|---|
| **NONMETALS** | | | |
| Abrasives: | | | |
| Tripoli earths | | 28 | -- |
| Other natural | | 3 | (1) |
| Dust and powder of natural or synthetic gem stones (except diamond) | kilograms | 24 | 213 |
| Grinding and polishing wheels and stones | | 2,523 | 1,598 |
| Asbestos | | 43,643 | 60,176 |
| Boron materials: | | | |
| Crude natural | | -- | 5,233 |
| Boric acid | | 9 | 13 |
| Bromine, elemental | | 105 | 1 |
| Clays and clay products, including all refractory brick: | | | |
| Crude clays: | | | |
| Ball clay | | 378 | 1,143 |
| Bentonite | | 5 | 13 |
| Earth clay | | 101 | 227 |
| Fire clay | | 5 | 12 |
| Fuller's earth | | 2 | 32 |
| Kaolin | | 92 | 310 |
| Other | | 629 | 460 |
| Clay products: | | | |
| Nonrefractory | | 1 | 211 |
| Refractory | | 27,343 | 6,564 |
| Diamond: | | | |
| Gem | value, thousands | $77,568 | $61,049 |
| Industrial | thousand carats | 455 | 490 |
| Diatomite (kieselguhr and infusorial earth) | | 880 | 1,725 |
| Fertilizer materials: | | | |
| Crude, natural: | | | |
| Nitrogenous, sodium nitrate | | 2,000 | -- |
| Phosphate rock | thousand tons | 875 | 1,101 |
| Manufactured: | | | |
| Nitrogenous: [2] | | | |
| Ammonium nitrate, ammonium sulfate, urea, nitrogen content | do | 680 | 1,138 |
| Other, gross weight | | 191,504 | 938,935 |
| Phosphatic | | -- | 3 |
| Potassic | | 462,754 | 571,208 |
| Mixed | | 720,869 | 498,472 |
| Feldspar, leucite, nepheline, nepheline syenite | | 3 | 3 |
| Fluorspar, cryolite, and chiolite | | 677 | 16,857 |
| Gem stones (except diamond): | | | |
| Natural, uncut: | | | |
| Emerald | value, thousand | $7,827 | $5,846 |
| Feldspar | do | $84 | (1) |
| Other | do | $714 | $859 |
| Synthetic and reconstituted, uncut | do | $62 | $53 |
| Graphite, natural | | 1,074 | 780 |
| Gypsum and plasters | | 10 | -- |
| Iodine, elemental (except colloidal) | | 214 | 310 |
| Lime, quicklime, hydrated lime | | 9 | 26 |
| Magnesite, crude | | 81 | 1 |
| Mica, worked | | 55 | 31 |
| Pigments, mineral: | | | |
| Iron oxide | | 1,150 | 811 |
| Other | | 168 | 139 |
| Salt | | 917 | 1,079 |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | | 2,735 | 3,981 |
| Caustic potash, potassium, sodium peroxide | | 2 | 43 |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | | 134 | 91 |
| Worked | | -- | 13 |
| Gravel and crushed stone: | | | |
| Quartz | | 4 | 27 |
| Other | | 56 | -- |
| Sand, excluding metal bearing | | 4 | 2 |
| Sulfur: | | | |
| Elemental | | 551,396 | 588,016 |
| Sulfuric acid | | 1 | 1 |
| Other: | | | |
| Crude nonmetal ores | | 10,822 | 10,595 |
| Slag and ash, not metal bearing | | 338 | -- |
| Oxides and hydroxides of barium, strontium, magnesium | | 91 | 223 |
| Fluorine and colloidal iodine | | -- | 84 |
| Building materials of asphalt, asbestos, fiber cement, unfired nonmetals, n.e.s | | -- | 1,148 |

See footnotes at end of table.

**Table 3.—India: Imports of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | | 1973 | 1974 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt, natural | | 266 | 1,083 |
| Carbon black and gas carbon | | 1,722 | 1,545 |
| Coal: | | | |
| Anthracite | | 6,738 | 35 |
| Other | | -- | 495 |
| Coke, all types | | 1,051 | 563 |
| Petroleum: | | | |
| Crude oil | thousand 42-gallon barrels | 98,034 | 103,155 |
| Refinery products: | | | |
| Gasoline | do | 300 | 315 |
| Kerosine and jet fuel | do | 7,099 | 6,603 |
| Distillate fuel oil | do | 4,535 | 2,775 |
| Residual fuel oil | do | 13,038 | 10,210 |
| Lubricants | do | 638 | 735 |
| Other | do | 1,590 | 425 |
| Total | do | 27,200 | 21,063 |
| Crude chemicals derived from the distillation of coal, oil, and/or natural gas | | 1,874 | 14,104 |

[1] Less than ½ unit.
[2] Some nitrogenous fertilizers are reported in terms of contained nitrogen, others in terms of gross weight, thus they cannot be added.

## COMMODITY REVIEW

### METALS

**Aluminum and Bauxite.**—Production of bauxite was significantly lower in 1974 than in either 1973 or 1972. Total mine output reached 1,113,000 tons, 14% below the 1973 level. The reduced production reflected the diminished demand for bauxite brought about by operating problems at domestic aluminum smelters. While bauxite production was off for the year, there were reports of the discovery in Orissa of significant ore reserves. Although surveys suggested the possibility of up to 1.05 billion tons of ore, only 77.4 million tons were classified as proven reserves.

Domestic production of aluminum declined for the second straight year to 128,900 tons, a drop of 16% compared with that of 1973. Most of the decline was caused by an exceptionally poor year at India's largest aluminum smelter, the Hindustan Aluminium Corp. Ltd.'s Renusagar plant. Located in Uttar Pradesh, the smelter accounts for almost half of the country's aluminum capacity. The State Electricity Board stopped supplying power to the smelter in January and did not resume its normal delivery schedule until much later in the year.

Electric power shortages failed to dampen the ambitious expansion plans of India's aluminum industry. At the beginning of the year, existing installed capacity was 195,000 tons per year. To that total the public sector's Bharat Aluminium Co.'s Korba smelter was scheduled to add 25,000 tons of capacity in December. The firm, India's first public venture in aluminum smelting, plans to bring an additional 75,000 tons capacity onstream before completion of the plant. Other plans call for the construction of a 30,000-ton-per-year smelter in Orissa and expansion of capacity at three existing smelters, adding 65,000 tons per year capacity. At yearend the status of a second public sector smelter to be located in Ratnagiri, Maharashtra, was indefinite. Moving the site of the proposed smelter to Gujarat State, was under consideration.

**Copper.**—One of the largest measurable improvements in the Indian mineral industries in 1974 came in copper mine production where ore output increased 38% to 20,100 tons, metal content. Although this amount was insufficient to meet the country's total requirements, the figure indicated that some of the developmental projects undertaken over the past few years were beginning to come onstream. India's copper industry began receiving increased interest from government planners a few years ago when higher prices for copper imports began to add to trade deficits. With large reserves and a growing demand for the metal, policy shifted towards providing for increased self-sufficiency. The 1974 cop-

per mine performance was solid evidence that this policy shift had begun to materialize.

Of the four major copper districts in the country, historically the biggest producer has been the Singbhum Belt in Bihar State. Development and expansion work continued on various projects within the State during the year. The Rakha copper project, undertaken with Canadian assistance, was funded for $53.3 million. Completion of the first of the two phases planned for the project will boost copper ore production by 300,000 tons per year. Eventual plans call for the construction of a 20,000-ton-per-year smelter to be built at the site. Reserves in the area have been estimated as high as 85 million tons of ore containing 1.3% copper. The Mosaboni group of mines was also under development during 1974. Over $53 million was allocated to developing these mines. When completed, they should add between 4,000 and 5,000 tons of ore per day to the country's copper supply. Also in Bihar, it was reported that the concentrator capacity at the Ghatsila complex was being increased.

In the Rajasthan producing district, development work at the Chandmari mine continued. It was reported that planned production from the mine upon completion would be 150,000 tons of ore per year. Production began at the Khetri smelter, India's largest copper smelter, late in the year. The plant, established with French collaboration, has a planned capacity of 31,000 tons of copper per year. Preliminary estimates indicated that copper production at the smelter would increase from 2,400 tons in Indian fiscal year 1974/75 (April 1, 1974 to March 31, 1975), to 8,000 tons the following year. Full capacity utilization was planned by 1979.

In Madhya Pradesh State, development of the Malanjkhand deposits continued to be studied. The deposits, estimated to run as high as 70 million tons of 1.3% copper, will be developed with assistance from the U.S.S.R. Plans call for production of 1 million tons of ore per year by 1978. Development costs for the mine and concentrator were expected to run to $32.9 million.

The Karnataka Copper Consortium was organized during 1974 to develop copper mining and concentrating facilities at Kalyadi and Thinthani in Karnataka State. The consortium consists of the Chitradurga Company, Hatti Gold Mines Ltd., and Mysore Minerals Co. Up to 13 million tons of ore reserves were believed to be located between the two sites. Scheduled completion date for development work was planned for late 1975. Between 15,000 and 18,000 tons per year of concentrate are eventually planned to be produced from the deposits.

**Gold.**—Production of gold at the government-subsidized Bharat Gold Mines Ltd. was 57,905 troy ounces during fiscal year 1973–74, while output at the Hatti Gold Mines in Karnataka was 45,013 troy ounces of gold from 225,000 tons of ore during the same period.

**Ilmenite, Rutile, Rare Earths, Monazite, Zircon.**—Definitive production data for monazite, rutile, and zircon were not available because the Government withheld the information under provisions of its Atomic Energy Act and as a separate security measure concealed ilmenite output. However, India's production of these commodities has never taken full advantage of the large reserves which the country possesses. During the year indications were that this underutilization of resources may be about to change, as many plans were released showing intent to increase capacity for mining, processing, and pigment manufacturing operations associated with these commodities.

An Australian firm was reportedly conducting feasibility studies for a large scale deep mining operation of ilmenite deposits in the coastal areas of Quilon and Alleppey in Kerala State. Kerala Minerals and Metals Ltd. planned to expand its capacity to produce processed ilmenite ore from 20,000 tons to 230,000 tons per year.

The mineral sand separation plant operated by Indian Rare Earths Ltd. at Manavalakurichi reportedly was to be expanded to treat 500 tons of raw sand per day and produce 65,000 tons of ilmenite per year, while the company's separation plant at Chavara was to expand its capacity to 130,000 tons per year.

In attempting to reduce its $3 million per year import bill for titanium dioxide pigments, an item which could be manufactured at home using domestic ilmenite reserves, India announced approval of plans to construct a 50,000-ton-per-year chloride-processing titanium pigment facility at Quilon. Additionally, it was reported that India signed letters of intent with

three companies for other similar plants. Although the ultimate outcome of these plans and proposals remained uncertain, they were evidence of an increased attempt to make better utilization of valuable resources.

**Iron Ore.**—Iron ore output recorded a 1% decline from that of 1973 with production reaching 35.3 million tons. In other developments it was reported that the 140-million-ton ore deposit discovered in Tiruvannamalai, Tamil Nadu, graded about 35% to 40% iron. A feasibility study will be conducted on upgrading the ore to a concentrate containing 63% iron.

During the year work continued on planning and developing numerous new iron mines throughout the country. Shortly after it was announced that Japan would shelve its plans to develop the Kudremukh deposits located in southwestern India, Iran signed an agreement with India to extend $300 million in credit to revive the project. Present plans call for the low-grade ore to be converted to slurry at the mine site and pumped 50 kilometers to the port of Mangalore where it will be converted to beneficiated pellets and shipped to Iran. An ultimate production of 5 million tons per year was envisaged. It was also announced that Mysore Minerals Co. was granted a lease to develop the 125-million-ton ore reserve located at the Supa Dam site in Karnataka State. Meanwhile, work on two other important projects did not proceed as rapidly as previously expected. Work on Deposit No. 5 at Bailadilla in Madhya Pradesh, already 2 years behind schedule, may be delayed another 2 years. Delays in the delivery of mining machinery for the project have been substantial. Work at another major mining project at Donimalai also proceeded slowly during the year and the most optimistic reports suggested that production will commence no earlier than late 1976.

In addition to mine development projects, two new iron ore pellet plants to be built by Chowgule & Co. Pvt. Ltd. were reported to have been approved for construction during the year. One plant, with a 2-million-ton-per-year capacity, was planned to be built near Mormugao Harbor in Goa while the second plant with a 6-million-ton-per-year capacity will be built further south near Kudremukh

Progress was made on expanding harbors of the two port cities of Mormugao and Visakhapatnam during the year to accommodate greater tonnages of iron ore for export. Scheduled for completion in 1976, were the unloading, storage, and loading facilities under construction at Mormugao which would handle 14 million tons per year. A new mechanical ore handling plant with four piers for unloading ore bearing river barges was also under construction. The conveyor system which will receive ore from the barges will be automated and capable of simultaneously moving three grades of ore to the storage yard where seven stackers will be employed. Adjacent to the ore storage yard, two ship loaders will be installed for loading ore carriers at the rate of 4,000 tons of ore per hour each. Upon completion a 100,000-ton ship will be able to be loaded in 2 days.

Work also continued on the projected 12-million-ton-per-year Visakhaptnam Harbor project. Although originally scheduled for completion in May 1974, the project was uncompleted at yearend. Carriers of 200,000 deadweight tons will eventually load at the port.

There were several notable developments pertaining to Indian iron ore exports during 1974. Chowgule & Co. Pvt. Ltd. entered into a contract with United States Steel Corp. to sell 1 million tons of iron ore during a 4-year period beginning in October 1974. India's state-owned MMTC signed contracts to supply steel companies in Belgium, France, West Germany, and the United Kingdom with 1.5 million tons in 1974–75 and 2 million tons in 1975–76. With its principal customer, Japan, MMTC was able to renegotiate price increases ranging from $2.25 to $3 per ton under existing contracts. Goan exporters learned during the year that MMTC was considering "canalizing" Goan ore exports in the same manner that iron ore exports from the rest of the country are. This would mean that the private Goan exporters could no longer negotiate contracts or set prices; rather, this would be done through a central export agency.

**Iron and Steel.**—The overall performance of India's iron and steel industry was down somewhat from that of 1973, but the production decline was not spread evenly throughout the year. Coking coal shortages seriously disrupted steel production in the early part of the year and forced the closing of most production facilities at the Jamshedpur steel mill for

the first time in 67 years. Once coal deliveries improved, however, production picked up dramatically and during the second half of the year iron and steel were produced at record rates.

Total pig iron production declined to 6,627,000 tons and output of ingot steel dropped 13% to 5,986,000 tons. Of the total ingot production, the major integrated steel mills accounted for an estimated 4,900,000 tons while electric arc furnaces at "mini" mills contributed an estimated 700,000 tons of carbon steel to the total. Alloy steel production of about 400,000 tons provided the balance. Steel imports in all forms totaled slightly less than 1 million tons. Perhaps the brightest spot in the ferrous metals picture was an 11% increase in ferroalloy production to 193,000 tons.

Of the five integrated steel mills, Tata Iron & Steel Co. Ltd. (TISCO) in the private sector continued to be one of the country's most efficient steel producers despite an eastern region power shortage that lowered output at the mill to 75% of capacity during the early months of the year. The power shortage precipitated a request to the Government to allow importation of equipment necessary to increase the mill's captive generating capacity by 70% to 85 megawatts. Also during the year, a Government Steering Committee was considering whether or not to implement a report from Japan's Nippon Steel Corp. recommending the expansion of the mill's ingot steelmaking capacity from 1.5 million tons to 5.5 million tons.[3]

During 1974 an extensive rehabilitation program continued at the antiquated Indian Iron & Steel Co. Ltd. (IISCO) mill at Burnpur. A partial restoration of the plant's coke oven batteries during the year helped raise finished steel production slightly to about 400,000 tons. It was estimated that the coke batteries would be back to full performance by late 1975.

Although expanded to a capacity of 1.8 million tons of ingot steel, Hindustan Steel Ltd.'s (HSL) Rourkela plant failed to break the 1-million-ton mark producing only an estimated 800,000 tons of finished steel. An abundance of fines in the ore, the high ash content of coking coal, and electric power shortages contributed to the plant's poor performance during 1974.

HSL's Bhilai steel mill, India's most consistent public sector steel producer, accounted for approximately 40% of the country's salable steel production during 1974. Due to its consistent performance, it has been proposed to expand the mill's capacity from 2.5 million to 4 million tons of ingot steel per year. Principal additions provided for in the expansion plans include the installation of three Linz-Donawitz (LD) converters (125-ton-per-heat capacity), four continuous casting machines, two sinter machines, and the construction of an additional coke oven battery. Progress was also made during the year on expanding and mechanizing the iron ore mines which supply Bhilai.

Both supply and operating problems continued to plague HSL's Durgapur plant during 1974. Poor maintenance was reportedly responsible for expansion equipment being used in substitution for the plant's original equipment. Although the plant was able to increase its output of salable steel almost 40% to 520,000 tons, production was below the rated capacity of 1.6 million tons of ingot steel.

Crude steel production was formally inaugurated at the giant public sector Bokaro Steel complex early in the year. The event marked the culmination of 10 years of planning and construction that had gone into the erection of what will eventually be India's largest steel mill. Ingots produced at Bokaro were shipped to the TISCO mill at Jamshedpur and the Bhilai mill for further processing until Bokaro's own hot-rolling mills can be utilized. The mill has been planned for an ultimate capacity of up to 10 million tons of steel ingot.

During the year, India's electric furnace carbon steel industry drastically curtailed its previously rapid rate of growth. This industry added about 700,000 tons to the country's steel supply during the year, down from 1 million tons produced in 1973. Only 25% of the total rated capacity of approximately 2.8 million tons per year was utilized. Unlike India's integrated iron and steel producers which are predominantly nationalized, the country's electric furnace carbon steel producers are largely private concerns. When a heavy excise tax on scrap was combined with electric power shortages, a number of furnaces were forced to cut production or shutdown entirely.

The alloy and specialty steels industry increased production to an estimated 400,000 ingot tons during 1974. Power short-

[3] The Hindu (India) Survey of Indian Industry 1974, Section II. May 1975, p. 33.

ages, particularly in the northern producing regions, prevented the additional production of an estimated 50,000 tons. Government plans call for a large and rapid increase in the capacity of this segment of the iron and steel industry because it has been particularly vulnerable to imports.

Due to the relative scarcity of the investment capital required for construction of integrated iron and steel mills, electric arc furnaces and minimills continued to occupy important positions in future development planning. Correspondingly, since the country has only minor scrap iron supplies but large iron ore reserves, interest in direct-reduction sponge iron technology as a means of providing raw material inputs to these furnaces was high. It was reported during the year that the state-owned Gujarat Industrial Investment Corp. Ltd. was planning to establish a sponge iron plant with an annual capacity of 180,000 tons per year using gaseous reduction techniques. Gas was to be obtained from the Ramol oilfield in Gujarat and iron ore from either Karnataka or Goa.

It was announced that India developed plans to export steel valued up to $125 million to Middle Eastern countries during Indian fiscal year 1974–75. If implemented, this would almost double steel exports recorded during 1973.

**Lead and Zinc.**—Mine production of zinc ores and concentrates increased 26% to 19,257 tons of contained zinc in 1974. Slab zinc output of 21,105 tons was a 69% increase over that of 1973. Lead mine production climbed to 9,147 tons of contained lead, while refined lead production increased 51% to 3,986 tons.

New deposits of both commodities were located during the year. A deposit of lead ore totaling 4 million tons was confirmed in the Gurubhatra area near Sikkim and Bhutan. Also, an estimated 1-million-ton deposit of complex copper-lead-zinc ore was reportedly located in the Sirohi district of Rajasthan.

Work proceeded on expanding both zinc ore and metal production at Hindustan Zinc Ltd.'s (HZL) Zawar-Dabari complex. Zinc ore production would be increased an estimated 2,000 tons per day when the Balaria zinc mine project near Zawar is commissioned in 1976. Ore would be concentrated at the mine site and the concentrate shipped 25 miles to HZL's Dabari smelter near Udaipur. In preparation for handling the increased supply of concentrate, the smelter was expanded to a capacity of 30,000 tons during the year when a $2 million furnace was installed. Slab zinc capacity will be expanded by 30,000 tons per year when the Vizakhapatnam smelter, authorized by the Government during the year, comes onstream. It was reported that the first phase of reconstruction at HZL's lead smelter at Tundoo in Bihar was near completion. When completed, the smelter will have a capacity of 3,600 tons per year. An eventual total capacity of 6,000 tons is planned.

**Manganese.**—In 1974 manganese ore production was 1,474,000 tons valued at $10.1 million. The country's ferromanganese industry reportedly suffered acute shortage of carbon electrode paste which in turn hindered production.

It was announced that the Steel and Mines Ministry planned to progressively reduce manganese ore exports in order to conserve ores to meet growing demand within the country. During Indian fiscal year 1974–1975, exports of ores containing 35% to 45% manganese were to be held to 60% of their 1971–72 level.

**Nickel.**—India's first nickel plant was approved by the Government during the year. The plant, to be built at Sukinda, Orissa State, would have an annual capacity of 4,800 tons of electrolytic nickel when it comes onstream in 1978. Proven reserves of 10.6 million tons of 1.2% nickel ore located nearby will provide feed for the plant. Up to 200 tons of byproduct cobalt will also be recovered annually.

**Silver.**—The Indian Government legalized silver exports for the first time since 1968 in order to reduce its availability for smuggling.

**Thorium.**—The Orissa State Government was reported to have acquired 200 hectares of land for a thorium plant to be operated by Indian Rare Earths Ltd.

**Vanadium.**—The Steel Authority of India was evaluating a proposal to establish ferrovanadium production facilities in Orissa.

## NONMETALS

**Fertilizer Materials.**—Although capacity at Indian fertilizer plants was expanded to 3.2 million tons per year with the commissioning of new plants at Kalol and Tuticorin, capacity utilization was estimated to have been only 60%. Nutrient content of fertilizer production was about 964,000

tons while estimated total demand for fertilizers was 3.6 million tons. The resultant gap between domestic supply and demand was met by purchasing increasingly expensive imports and lowering agricultural production goals. Causes of production shortfalls were attributed largely to electric power cutbacks and labor disputes. Particularly hard hit was The Fertilizer Corporation of India Ltd.'s ammonia-urea complex at Durgapur where power restrictions threatened to close the plant.

In efforts to close the domestic supply-demand gap for fertilizers, progress and plans on constructing several new plants continued. Increased emphasis was placed on adopting coal-based fertilizer technology at new plants. In addition to the increased capacity resulting from the opening of plants at Kalol and Tuticorin, work commenced on expanding capacity at the Fertilizers & Chemicals Travancore Ltd. (FACT) plant at Ambalamedu. Construction at another new plant site located in Paradeep was also initiated. Other locations reportedly approved for new plants during the year included Sindri, Bhatinda, Panipat, and Kakinada. In addition to these projects, work was either under way or under evaluation on up to 12 other fertilizer plants.

Three projects receiving special attention from the Government included coal-based fertilizer plants at Talcher (Orissa), Ramagundam (Andhra-Pradesh), and Korba (Madhya Pradesh). The Talcher and Ramagundam plants were scheduled for commissioning in January 1976 while the Korba plant may not come onstream until late 1979. Although capital costs for coal-based fertilizer plants have exceeded those for plants based on fuel oil or naphtha feedstocks by as much as 40%, the coal technology installations became increasingly tenable as costs for the more traditional feedstocks rapidly escalated. India's abundant coal reserves made the new technology even more appealing. Interest was particularly high in the Ramagundam plant which will be the largest of its kind in the world. Approximately 1 million tons of coal will be consumed in producing 550,000 tons of urea per year. Pulverized coal will be gasified using the Kopper Totzek process. The raw gas will then be purified by use of the Rectisol process and converted to $CO_2$ gas. The Montecatini process will be used for ammonia synthesis and urea manufacture.[4] The Government was hopeful that experience gained from the new plants would prove valuable in setting up other coal-based fertilizer plants.

Imports of manufactured fertilizers reached 2.5 million tons during the year. Of the total, about 750,000 tons came from centrally controlled economy countries. Due to rapidly rising import prices and the Government's practice of absorbing 50% of the purchase cost in subsidizing domestic consumers, reports indicated that the Government might have to cut back its level of imports. Meanwhile, prices for domestic nitrogen, held down by government controls, were not yielding a return sufficient to attract needed investment capital. This forced the Government to increase domestic nitrogen prices between 75% and 90% in June. When the Government stiffly boosted the price of gasoline to curb demand so feedstock would be diverted to Naphtha production, the increased naphtha output was not absorbed by domestic fertilizer plants and was subsequently made available for export.

**Mica.**—Crude production of mica was 18,342 tons valued at $2.7 million during 1974. Exports of all mica products totaled 35,549 tons.

During the year, the Mica Trading Corp. of India (a subsidiary of MMTC) became the chief marketing agent for the country's mica industry. The new company has the responsibility for negotiating export contracts. The company also plans to discourage the export of relatively low value processed mica. Instead, exports of higher value products such as fabricated mica, reconstituted mica, and mica powder will be encouraged.

**Phosphate Rock.**—India's 1974 phosphate rock production was 433,500 tons valued at $4.3 million. During the year, the Government established a committee to study the techno-economic aspects of further developing the Jhamarkota phosphate rock deposits in Rajathan. Reserves measuring 35 million tons have been proven in the area.

## MINERAL FUELS

**Coal and Lignite.**—When the price of petroleum quadrupled, relatively coal-rich petroleum-poor India was forced into completely revising its national energy policies

[4] The New Sketch (India). V. 35, No. 14, Jan. 13, 1975, p 36.

and priorities. Accompanying these policy changes was a reorganization of the entire domestic coal industry bringing practically all mines under public ownership. During 1974 changed energy policies and a reorganized industry began to manifest themselves in positive terms as coal production increased 7% to 86.3 million tons. The industry also began taking some of the difficult steps necessary to deal with both short- and long-run obstructions to increased coal supplies.

During the year, a central planning organization was established within the Coal Mines Authority Limited (CMAL) to undertake development planning, design, and research. The organization, called the Central Mine Planning and Development Institute (CMPDI), undertook 24 feasibility project reports, 22 of which were approved for implementation. Included was a large project, prepared with Soviet assistance, which envisaged 13 open pit mines with an ultimate production capacity of 76 million tons per year in the Singrauli coalfield. Two large underground projects under study in the Raniganj Field called for an ultimate production of 10 million tons per year. Other studies, conducted with KOPEX (Overseas Mining Corporation of Poland), were aimed at reconstructing and reorganizing the vastly inefficient Jharia coking coalfields. All plans under consideration called for an increased amount of the total coal supply to come from more efficient open pit mines.

In addition to plans and feasibility studies aimed principally at opening up new coal mines, numerous other steps were taken during the year to boost productivity at existing mines above 0.6 tons per manshift. This low productivity figure comes from the fact that scarcely a dozen of India's coal mines are mechanized. Hence, a large effort was devoted to speeding mechanization of the mines. The Mining and Allied Machinery Corp. of India, a government undertaking, received orders worth $12.5 million for sophisticated equipment to modernize Indian coal mines. Coal mining equipment companies in Poland, the U.S.S.R., and the United Kingdom received orders for plants and equipment. In an attempt to strengthen a weak coal exploration program, CMAL reported that it would more than triple its number of drilling rigs from 17 to 54 by May 1975. To help accommodate the disruption that will occur when the influx of heavy machinery begins to impact on the coal mines, four training institutes were opened throughout the country to teach skills necessary to maintain and operate the equipment.

In addition to steps taken to increase coal supply through opening up new mechanized mines, Bharat Coking Coal Ltd. also considered methods of obtaining additional coking coal from existing mines through such methods as deepening mine shafts and increased pillar robbing.

During the year attempts were made to reinforce the coal industry's supporting explosives, electric power, and transportation services. Proposals were made to start new explosives factories at Ramagundam and Bhandara. The Damodar Valley Corp., the chief electric power supplier to the Bengal-Bihar coalfields, made plans to substantially increase its thermal generating capacity at Durgapur, Chandrapura, and Bokaro by 1979.

One of the largest impediments to increased coal supplies in the past was the tieup of coal-carrying rail cars at a large number of small inefficient railheads. This problem was at least partly rectified in 1974 as nationalization of the mines enabled CMAL to consolidate and reduce the number of railheads, thereby simplifying the coal collecting and loading situation. Efforts also were made to boost the amount of coal moved by ship to southern consuming districts. The Haldia port with mechanical facilities for handling up to 3.5 million tons of coal was to have been commissioned in 1974. New vessels were ordered for coastal coal trade in efforts to bring the gross registered tonnage of coastal vessels to a capacity sufficient to carry up to 5 million or 6 million tons of coal per year. Finally, the CMPDI was studying the possibilities of a slurry pipeline to transport coal from Kedla and the proposed Bamgarh washeries to Bokaro Steel.

Possibly the largest most complex problem area in the Indian coal industry showed virtually no improvement over the previous year's performance, as 43% capacity utilization equaled that of 1973. Total capacity of India's coal washeries was 26 million tons, sufficient to meet its present demands for washed coal. However, equipment problems kept most of the country's 14 washeries operating at less than one-half capacity. Plans revealed during

the year to build four new washeries in Sudamdih, Monidih, Ramgarh, and Kedla should help increase India's supply of washed coal over the long run.

**Petroleum and Natural Gas.**—During the year, increased costs for imported crude oil and refinery construction resulted in a slight shifting of the Government's interest from building expensive new refinery capacity to increased attention to developing a more self-reliant position in crude petroleum production.

*Government Actions.*—Numerous actions were taken by the Government in furthering its involvement in the domestic petroleum industry during 1974. In March, the Government acquired 74% ownership of Exxon's India operations. The remaining 26% interest will be purchased by the Government in 1981. Upon finalization of the sale, the company was renamed Hindustan Petroleum Corp. The Minister for Petroleum and Chemicals said that similar agreements with the country's two other foreign-based private oil companies, Caltex Oil Refining (India) Ltd. and Burmah-Shell Refineries Ltd., would be concluded as soon as possible. It was reported that the Government of India may seek full ownerhip in the Indian operations of these companies.

In other actions, the Government introduced a tax on indigenous crude oil production. Revenues from the tax were to be disbursed by the newly created Oil Industry Development Board. Reportedly most of the money would initially be used to help defer costs of offshore oil exploration.

*Exploration, Drilling and Crude Oil Production.*—Highly dependent on Middle Eastern imports for much of its crude petroleum requirements when large price increases were announced in 1973, India was forced into searching for new domestic fields. During 1974 the country's efforts to increase its self-sufficiency in crude oil began to pay off with the discovery of apparently large commercially exploitable deposits in the Gulf of Cambay off India's west coast in an area known as Bombay High. The Bombay High drilling was part of a large exploratory scheme in promising oil-bearing areas located both on- and offshore. Data collected from three wells drilled during the year indicated the presence of up to 1 billion barrels of high-quality crude oil. The Government was considering plans for drilling up to 200 production wells, each capable of producing over 2,000 barrels of crude oil per day. In addition to the Government's drilling in the Bombay High, two U.S. companies contracted to conduct offshore oil prospecting activities in the Gulf of Kutch and the Bay of Bengal. Although results of offshore drilling were encouraging, the country was having difficulties in obtaining the production rigs necessary to exploit the newly discovered fields. Once this problem is solved, the Government will have to face the expensive proposition of transporting crude oil to onshore refineries.

In addition to its ambitious offshore exploration program, India also attempted to intensify its onshore oil prospecting efforts. Both Oil India Ltd. and the Indian Oil and Natural Gas Commission (IONGC) increased their deep well exploration operations in the northeast provinces of Assam and Tripura. The IONGC also was reportedly drilling in 12 different sites throughout Gujarat. Other new exploratory wells were either being planned or drilled in the previously nonproducing states of Kashmir, Himachal Pradesh, and Rajasthan.

In efforts to increase its self-sufficiency with respect to exploration and development of domestic petroleum deposits, IONGC was developing a program to stimulate and encourage indigenous manufacture of different types of drilling rigs.

Crude petroleum production increased 1% over that of 1973 to 55.7 million barrels. Gross production of natural gas also improved over that of 1973 to a total of 67,716 million cubic feet, a 14% increase.

*Refining.*—Efforts to increase India's total refinery capacity slowed during the year as total utilization reached about 75% of capacity. Plans to build a 90,000-barrel-per-day refinery in Goa were reportedly canceled while no further work was done at a refinery construction site in Bongaigaon. High construction costs caused a reexamination of plans to build a 120,000-barrel-per-day refinery at Mathura. Meanwhile, work progressed on a new refinery at Haldia to a point where trial runs were made.

*Imports.*—India's crude oil imports totaled 103 million barrels during 1974, approximately two-thirds of the country's total crude requirements. Although exact figures were not available, Iran was believed to be the largest crude supplier. Saudi Arabia and Iraq were other principal

sources of crude imports. Imports of refined petroleum products amounted to 21 million barrels.

India's dependency on imports combined with large price increases resulted in yet another large outflow of the country's limited foreign exchange. Imported oil bills escalated from 13% of export earnings in 1972 to an estimated 40% in 1974. This led India into entering barter agreements, deferred payment plans with reduced interest rates, and joint ventures in order to lessen the impact of increased oil prices on the country's foreign exchange accounts. The largest contract of this type was made with Iran. Terms of the contract call for India to pay $3.50 per barrel cash for its Iranian oil purchases with an additional payment of $6.50 per barrel due at the end of 5 years at a 2½% interest rate, an effective 25% savings on current market prices.

India also planned or contributed to numerous joint ventures aimed at finding or developing oil deposits in foreign countries during the year. India shared production of certain Persian Gulf oilfields with Iran and entered exploration agreements with Libya, Iraq, and Romania.

# The Mineral Industry of Indonesia

By Walter Pajalich [1]

Indonesian mineral policy rests upon the principle that minerals are the property of Indonesian people. With this orientation, a balance has been sought between the working environment necessary to attract foreign investment at the desired level and at the same time maximize Indonesian control and income from mining operations.

Mineral Law No. 11 on the Basic Provisions of Mining, passed in 1967, reopened Indonesia to large-scale foreign investment. Agreements executed under this law expanded the Nation's earnings from mineral resources and set the pattern of cooperation with foreign investors. Individual mining companies were given rights to explore and exploit specific minerals within defined areas. The contracts defined the companies' obligations and privileges throughout the survey, exploration, and production stages in such matters as relinquishment, employment and training of nationals, tax obligations or privileges and transfer of funds.

However, contracts concluded since 1967 have progressively broadened the benefits to Indonesia and narrowed the privileges of foreign firms. Provisions of the latest contracts provide for the offer of share participation to Indonesians and commit contractors to obtain their supplies from domestic sources to the greatest possible extent, provide amenities for the communities in which they operate, and maximize employment and training for Indonesian citizens. Processes underway to alter the provisions of the Contracts of Work may be why no new contracts have been signed. It is reported that there are 22 pending applications.

A change in the organizational form of existing State mining enterprises is in progress which would give them fuller control of their own budgets and authority to take part in joint ventures. The new energy policy calls for development of alternate forms of energy with emphasis on reviving the use of the country's vast coal resources in place of oil in order to maximize oil exports. There is also a growing interest in the generation of power from geothermal energy, hydroelectric plants, and nuclear reactors.

New financial wealth has given Indonesia better bargaining position with foreign investors. This is not only true with new incoming investors but the feeling is that old Contracts of Work could be renegotiated.

Indonesia has been successful, after several years of negotiation, in obtaining an agreement for building the enormous Asahan hydroelectric and aluminum smelting project in Central Sumatra. Their bargaining leverage was strong enough to give the Japanese a 30-year license before the project is nationalized.

The January 1974 riots stimulated a series of policy announcements that will effect foreign participation in Indonesia's mineral development. These announcements indicated that the Government of Indonesia is prepared to accept some reduction in volume of foreign investment if needed, in order to better direct the remainder toward national objectives. The decisions of general application would require 51% Indonesian participation in any venture involving foreign direct investment. Implementaton of this provision in the mineral field would involve participation of the State mineral enterprises.

The new policy has encouraged the Department of Mines to try various programs to build up Indonesian-owned mining enterprises. One of the ways the Department

[1] Mining engineer, Division of Nonmetallic Minerals

hopes to achieve this is by limiting foreign participating interest only to those mineral activities where the foreign investors' financial, technical, and marketing resources are clearly needed. No further Contracts of Work will be granted to foreign companies for coal, tin, lateritic nickel, bauxite, iron sands, alluvial nonmetallic minerals, or manganese mining in Java, Madura or Bali. At the same time the Department is encouraging Indonesian miners with direct and indirect assistance. In connection with this, foreign investors will be excluded from projects capitalized at less than $5 million and from projects smaller than $10 million on Java and Bali.

## PRODUCTION

Production of the major mineral commodities—oil, copper, iron sands, and tin—increased substantially. Increases in crude oil production were primarily due to expansion of exploration and development programs by foreign contractors. World demand and increases in prices made oil the most important item in the economy of Indonesia. Of the nonfuel minerals, the most dramatic increase was in the production of copper concentrates, which increased about 41% over the 1973 production. This was followed by iron sands with an increase in production of 23%, tin metal 3%, bauxite 5%, and nickel 1%.

**Table 1.—Indonesia: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Aluminum, bauxite, gross dry weight ---- thousand tons | r 1,148 | 1,106 | 1,161 |
| Copper, mine output, metal content ---- | r 3,001 | 38,743 | 65,475 |
| Gold metal [2] ---- troy ounces | r 13,121 | 48,957 | 76,491 |
| Iron and steel, iron sand, dry basis ---- | r 251,669 | 266,891 | 346,946 |
| Lead, mine output, metal content ---- | e 200 | e 200 | -- |
| Manganese ore ---- | r 7,581 | 12,308 | 18,037 |
| Nickel, mine output, metal content [3] ---- | 22,442 | 20,816 | 21,093 |
| Silver [4] ---- thousand troy ounces | r 301 | 819 | 1,074 |
| Tin: | | | |
| Mine output, metal content ---- long tons | r 15,423 | 15,937 | 18,220 |
| Metal ---- do | 11,819 | 14,401 | 14,828 |
| **NONMETALS** | | | |
| Asbestos ---- | NA | NA | 283 |
| Cement, hydraulic ---- thousand tons | 596 | 730 | 831 |
| Clays, kaolin powder ---- | 6,013 | 29,610 | 25,972 |
| Diamond: | | | |
| Industrial e ---- thousand carats | 4 | 4 | 4 |
| Gem e ---- do | 14 | 16 | 16 |
| Total e ---- do | 18 | 20 | 20 |
| Fertilizer materials: | | | |
| Crude, phosphate rock ---- | NA | 819 | 5,563 |
| Manufactured: | | | |
| Nitrogenous ---- | 116,727 | 56,955 | 107,280 |
| Other, including mixed ---- | 29,389 | 119,759 | 97,539 |
| Ammonia ---- | r 2,639 | 1,291 | 3,108 |
| Gypsum e ---- | 8,000 | 8,000 | -- |
| Iodine ---- kilograms | 10,035 | 19,357 | 25,933 |
| Salt, all types e ---- thousand tons | 180 | 200 | 200 |
| Stone: | | | |
| Limestone ---- do | 838 | r 996 | 1,114 |
| Quartz ---- | 52,888 | 52,805 | 62,688 |
| Sulfur, elemental [6] ---- | r e 1,000 | 1,463 | 2,193 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Asphalt rock, bitumen content e ---- | 34,500 | 28,500 | 22,600 |
| Carbon black e ---- | 1,400 | 1,400 | 2,700 |
| Coal ---- thousand tons | 179 | 149 | 156 |
| Gas, natural: | | | |
| Gross production ---- million cubic feet | 146,481 | 186,137 | 202,335 |
| Marketed ---- do | r 43,562 | 53,296 | 72,185 |
| Natural gas liquids: | | | |
| Propane and butane ---- thousand 42-gallon barrels | e 10 | 10 | 9 |
| Natural gasoline ---- do | e 30 | 33 | NA |
| Petroleum: | | | |
| Crude ---- do | r 395,552 | 488,536 | 501,838 |

See footnotes at end of table.

**Table 1.—Indonesia: Production of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Petroleum—Continued | | | | |
| Refinery products: | | | | |
| Gasoline | thousand 42-gallon barrels | 11,412 | 12,819 | 14,042 |
| Jet fuel | do | 1,181 | 960 | 1,510 |
| Kerosine | do | 15,328 | 19,495 | 22,036 |
| Distillate fuel oil | do | 12,877 | 14,904 | 19,088 |
| Residual fuel oil | do | 12,620 | 3,394 | 12,159 |
| Lubricants (including grease) | do | 81 | 82 | 82 |
| Other: | | | | |
| Liquefied petroleum gas | do | 71 | 104 | 194 |
| Petroleum wax | do | 568 | 760 | 788 |
| Naphtha | do | 1,467 | 1,225 | 4,384 |
| Unfinished oils requiring further processing | do | 45,112 | 58,937 | 43,694 |
| Unspecified | do | 1,235 | 757 | 1,193 |
| Refinery fuel and losses | do | 1,626 | 4,383 | 6,387 |
| Total | do | 103,528 | 117,770 | 125,507 |

e Estimate. p Preliminary. r Revised. NA Not available.
[1] In addition to the commodities listed, a variety of crude construction materials (such as clays, stone, sand, and gravel) are also produced, but available information is inadequate to make reliable estimates of output levels.
[2] Officially reported Indonesian statistics representing government output; private production by small unorganized producers may be as much as 30,000 troy ounces per year. Some gold recovered from copper concentrate.
[3] Includes a small amount of cobalt which is not recovered separately.
[4] Some silver recovered from copper concentrate.
[5] The limestone figure is understated by the considerable amounts of limestone produced by enterprises under local jurisdictions for building materials, for crushed rock to be used as aggregate, and to burn for lime.
[6] Sulfur produced by other than Frasch process.

## TRADE

Mineral commodity exports during 1974 accounted for more than half of the value of total export trade. Crude oil and refined products were the most significant mineral exports. The high world oil prices increased export earnings from this mineral fuel about 70%. Export earnings from tin and copper concentrate increased 49% combined, nickel ore 21%, and bauxite 3%.

Japan continued as a major customer for mineral exports and was a major supplier of mineral commodities to Indonesia. The main mineral imports were cement, manufactured fertilizers, and iron and steel products.

**Table 2.—Indonesia: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum, bauxite and concentrate | 1,177,812 | 1,286,858 | Japan 1,129,944; Canada 156,914. |
| Copper metal including alloys: | | | |
| Scrap | 3,856 | 2,061 | Singapore 924; Japan 653; Hong Kong 484. |
| Unwrought | 9,120 | 84,950 | Japan 59,041; West Germany 25,808; Singapore 101. |
| Gold and silver ore and concentrate (including matte) troy ounces | 129 | -- | |
| Iron and steel: | | | |
| Ore and concentrate | 6 | -- | |
| Scrap | 23,262 | 21,133 | Taiwan 6,710; Singapore 6,628; Japan 3,760. |
| Lead metal including alloys, scrap | 162 | -- | |
| Manganese ore and concentrate | 262,930 | 248,061 | Japan 247,229; Netherlands 811; Australia and Tasmania Island 21. |
| Nickel ore and concentrate | 837,675 | 566,562 | All to Japan. |
| Silver metal including alloys troy ounces | 170,206 | 833,764 | Singapore 568,103; Japan 256,084; West Germany 10,417. |

See footnote at end of table.

## Table 2.—Indonesia: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Tin: | | | |
| Ore (including slags and ash) long tons | 10,772 | 9,147 | All to Malaysia. |
| Metal including alloys, all forms: | | | |
| Scrap do | 324 | 185 | All to Japan. |
| Unwrought do | 9,839 | 13,949 | Netherlands 5,399; Japan 4,523; United States 3,016. |
| NONMETALS | | | |
| Sulfur | 7 | 10 | All to Singapore. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 302,280 | 365,267 | Japan 259,356; United States 67,311. |
| Refinery products: | | | |
| Gasoline, motor do | 1,460 | 1,347 | Japan 833; United States 321; Singapore 77. |
| Kerosine, white spirit do | 75 | 50 | Singapore 3.[1] |
| Distillate fuel oil do | 2,501 | 782 | Japan 225; Norway 153; Liberia 152. |
| Residual fuel oil do | 27,077 | 55,488 | Japan 50,808; Singapore 1,813; United States 1,303. |
| Other: | | | |
| Paraffin wax do | 324 | 520 | Singapore 299; United States 60; Mexico 44. |
| Unspecified do | 67 | -- | |
| Total do | 31,504 | 58,187 | |

[1] Partial detail only, excludes 46,463 barrels reported as exported to unspecified countries.

## Table 3.—Indonesia: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | -- | 6 | All from United States. |
| Oxide and hydroxide | -- | 7,138 | Japan 3,849; People's Republic of China 1,623; Singapore 1,104. |
| Metal including alloys: | | | |
| Scrap | 259 | 139 | Malaysia 30; People's Republic of China 9. |
| Unwrought | | 2,674 | United States 913; Australia 282; Ghana 259. |
| Semimanufactures | 12,966 | 19,315 | Japan 6,306; Australia 3,000; Singapore 1,688. |
| Antimony metal including alloys, all forms | 80 | -- | |
| Arsenic trioxide, pentoxide, acids | -- | 82 | West Germany 44; People's Republic of China 13; Sweden 11. |
| Beryllium metal including alloys, all forms | -- | 2 | All from West Germany. |
| Chromium oxide and hydroxide | -- | 93 | Japan 71; West Germany 14; Hong Kong 6. |
| Cobalt oxide and hydroxide | -- | 109 | France 101. |
| Columbium and tantalum, tantalum metal including alloys, all forms | -- | 2 | All from Japan. |
| Copper: | | | |
| Matte | -- | 3 | West Germany 2; United States 1. |
| Copper sulfate | 110 | 195 | Taiwan 51; West Germany 50; Belgium-Luxembourg 48. |
| Metal including alloys, all forms | 5,369 | 6,020 | Japan 2,243; Australia 1,759; West Germany 614. |
| Iron and steel: | | | |
| Ore and concentrate | -- | 5 | All from Sweden. |
| Scrap | 3,844 | 16,138 | West Germany 10,943; Australia 2,895; Taiwan 600. |
| Metal: | | | |
| Pig iron, ferroalloys, similar materials | 25,272 | 22,325 | Australia 16,215; West Germany 2,479; Thailand 1,450. |
| Steel, primary forms | 1,243 | 67,255 | Japan 24,322; West Germany 19,977; North Korea 7,124. |

See footnotes at end of table.

Table 3.—Indonesia: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Metal—Continued | | | |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 242,911 | 409,280 | Japan 188,399; Taiwan 98,686; Australia 12,591. |
| Universals, plates, sheets | 286,276 | 366,498 | Japan 284,714; South Korea 17,977; Australia 17,118. |
| Hoop and strip | 10,885 | 53,695 | Japan 45,672; Taiwan 7,341; Australia 196. |
| Rails and accessories | 19,697 | 11,348 | West Germany 3,240; Australia 2,934; France 1,674. |
| Wire | 78,729 | 44,792 | Japan 28,635; People's Republic of China 8,081; Taiwan 2,558. |
| Tubes, pipes, fittings | 128,286 | 176,267 | Japan 113,128; United States 36,553; Singapore 6,851. |
| Castings and forgings, rough | 1,051 | 848 | Australia 281; Japan 45. |
| Lead: | | | |
| Oxides | 218 | 496 | Australia 270; Japan 61. |
| Metal including alloys, all forms | 1,459 | 3,023 | Australia 2,524. |
| Magnesium metal including alloys, all forms | -- | 29 | Japan 17; Taiwan 10. |
| Manganese: | | | |
| Ore and concentrate | -- | 3,725 | Singapore 3,596. |
| Oxides | -- | 3,983 | Japan 3,233; Singapore 433. |
| Mercury 76-pound flasks | 120 | 87 | Mainly from Japan. |
| Nickel: | | | |
| Matte, speiss, similar materials | -- | 2 | Japan 1; West Germany 1. |
| Metal including alloys, all forms | 1,311 | 1,495 | West Germany 1,048; Canada 216; Japan 190. |
| Platinum-group metals including alloys, all forms thousand troy ounces | (1) | 1,093 | All from West Germany. |
| Silver metal including alloys troy ounces | 206 | 76 | United States 61; Singapore 15. |
| Tin metal including alloys, all forms long tons | 546 | 132 | Japan 97; Singapore 15. |
| Titanium oxides | -- | 4,469 | Japan 2,739; West Germany 461; United Kingdom 377. |
| Tungsten metal including alloys, all forms | -- | 176 | United States 157; Japan 11; Canada 8. |
| Uranium and thorium oxides, including rare-earth oxides | -- | 77 | France 45; People's Republic of China 14; United States 10. |
| Zinc: | | | |
| Oxide | 1,364 | 2,468 | Australia 917; India 524; People's Republic of China 444. |
| Metal including alloys: | | | |
| Scrap and blue powder | -- | 463 | Japan 215; Australia 200. |
| Unwrought and semimanufactures | 46,932 | 25,854 | Australia 13,577; Japan 8,763; Singapore 2,566. |
| Other: | | | |
| Ore and concentrate of base metals, n.e.s | 575 | -- | |
| Ash and residue containing nonferrous metals | -- | 11 | Japan 10; Singapore 1. |
| Oxides, hydroxides and peroxides of metals, n.e.s | -- | 304 | Singapore 181; West Germany 71; Japan 26. |
| Metals including alloys, all forms: | | | |
| Metalloids | -- | 343 | West Germany 116; Singapore 104. |
| Alkali, alkaline earth, rare-earth metals | -- | 32 | Singapore 12; United Kingdom 8; Netherlands 6. |
| Pyrophoric alloys, ferrocerium | -- | 42 | Singapore 14; Hong Kong 9. |
| Base metals including alloys, all forms, n.e.s | 77 | 33 | Australia 10; Japan 8. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 149 | 320 | Japan 90; West Germany 82; Singapore 62. |
| Dust and powder of precious and semiprecious stones | -- | 1 | All from Singapore. |
| Grinding and polishing wheels and stones | 295 | 383 | Australia 102; West Germany 95; People's Republic of China 59. |

See footnotes at end of table.

## Table 3.—Indonesia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Asbestos | 1,377 | 3,797 | Canada 3,348; Australia 181. |
| Barite and witherite | -- | 46,950 | Thailand 23,286; United States 12,099; Singapore 8,134. |
| Boron materials: | | | |
| Crude natural borates | -- | 161 | United States 152; Singapore 8. |
| Oxide and acid | -- | 92 | United States 59; West Germany 14. |
| Cement thousand tons | 1,200 | 1,497 | Philippines 473; Thailand 334; Japan 200. |
| Chalk | 36 | 100 | Japan 51; France 20; West Germany 12. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Kaolin | 1,406 | NA | |
| Kyanite | NA | 16,619 | United States 7,637; Japan 2,492; Singapore 1,845. |
| Other | 24,019 | NA | |
| Products: | | | |
| Refractory (including nonclay bricks) | 8,868 | 21,629 | Thailand 6,846; Australia 3,414; Taiwan 2,832. |
| Nonrefractory | 151 | 4,215 | Japan 2,188; West Germany 414; Philippines 405. |
| Cryolite and chiolite | -- | 96 | Singapore 80; Hong Kong 16. |
| Diamond, gem, cut thousand carats | 1,250 | -- | |
| Diatomite and other infusorial earth | -- | 1,014 | Japan 375; Singapore 355; United States 96. |
| Feldspar, leucite, nepheline | -- | 1,068 | Italy 605; People's Republic of China 192; Hong Kong 87. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 354 | 84 | West Germany 44; Netherlands 40. |
| Phosphatic | 120,500 | 3 | All from Singapore. |
| Potassic | -- | 6 | United Kingdom 5; West Germany 1. |
| Manufactured: | | | |
| Nitrogenous | 431,798 | 364,405 | Japan 153,690; Netherlands 43,120; United States 42,665. |
| Phosphatic | 120,500 | 229,664 | United States 54,309; Netherlands 52,265; Japan 46,885. |
| Potassic | 29,748 | 72,925 | Canada 26,264; West Germany 21,127; France 7,182. |
| Other, including mixed | 67,581 | 6,680 | Japan 3,232; Netherlands 3,009. |
| Ammonia | 11 | 179 | Netherlands 73; Taiwan 46; Japan 34. |
| Graphite, natural | [2]550 | 158 | West Germany 53; Japan 47; People's Republic of China 42. |
| Gypsum and plasters | 26,220 | 31,586 | Australia 27,000; Thailand 4,000. |
| Lime | 411 | 490 | Singapore 290; Malaysia 112; United States 61. |
| Magnesite | -- | 138 | Japan 51; West Germany 30; People's Republic of China 22. |
| Mica, all forms | 57 | 469 | United States 229; Japan 145. |
| Pigments, mineral: | | | |
| Natural, crude | 8,939 | 308 | Poland 170; People's Republic of China 46; Czechoslovakia 33. |
| Iron oxides, processed | 563 | 639 | People's Republic of China 312; West Germany 198; Japan 70. |
| Precious and semiprecious stones, except diamond, manufactured value | $280 | $1,000 | All from Singapore. |
| Salt and brine | 26,602 | 4,956 | India 2,500; Japan 1,226; United States 814. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 44,317 | 51,004 | United States 13,171; Netherlands 11,017; West Germany 8,816. |
| Caustic potash, sodic, potassic peroxides | 1,345 | 8,361 | Japan 2,681; Kenya 2,523; France 861. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 36,725 | 5,801 | Malaysia 5,185; Singapore 424; Taiwan 102. |
| Worked | 8,212 | 6,714 | Malaysia 2,338; Japan 1,603; People's Republic of China 746. |
| Dolomite, chiefly refractory grade | -- | 1,101 | Taiwan 1,092. |
| Gravel and crushed rock, n.e.s | -- | 4,049 | Singapore 3,605; Malaysia 232. |
| Limestone (except dimension) | 17,248 | 20,829 | Ireland 15,000; Singapore 5,730. |
| Quartz and quartzite | -- | 110 | Hong Kong 84; People's Republic of China 20; West Germany 6. |
| Sand, excluding metal bearing | -- | 1,887 | Singapore 1,444; United States 407. |

See footnotes at end of table.

## Table 3.—Indonesia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 23,242 | 28,092 | United States 14,224; Canada 8,200; Iran 3,500. |
| Colloidal | -- | 16,301 | Canada 12,893; Iran 3,000. |
| Sulfur dioxide | 15 | 770 | Singapore 750; West Germany 20. |
| Sulfuric acid; oleum | 739 | 748 | Singapore 582; Malaysia 109. |
| Talc, steatite, soapstone, pyrophyllite | -- | 10,733 | People's Republic of China 6,340; Taiwan 1,323; South Korea 1,246. |
| Other nonmetals, n.e.s.: | | | |
| Crude | -- | 1,054 | Singapore 528; Japan 252; United States 144. |
| Oxides and hydroxides of magnesium, strontium and barium | -- | 384 | Japan 173; United States 100; United Kingdom 71. |
| Bromine, iodine, fluorine | -- | 503 | Japan 236; United States 221. |
| Building materials of asphalt, asbestos, fiber cement, unfired nonmetals, n.e.s | 16,147 | 20,806 | Australia 6,190; Singapore 5,686; Thailand 4,595. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 28 | 14,621 | Singapore 10,952; United States 2,248; Malaysia 797. |
| Carbon black and gas carbon: | | | |
| Carbon black | 6,382 | 8,236 | Australia 5,573; Japan 1,904; West Germany 340. |
| Gas carbon | -- | 4 | Japan 2; Singapore 1; West Germany 1. |
| Coal, all grades, including briquets | [3]10,092 | 111 | United States 43; United Kingdom 37; Singapore 25. |
| Coke and semicoke | 10,152 | 4,764 | Taiwan 3,207; Japan 1,276. |
| Gas, hydrocarbon, manufactured | -- | 55 | Singapore 23; West Germany 18. |
| Hydrogen and rare gases | -- | 113 | Japan 39; Australia 33; Singapore 18. |
| Peat, including peat briquets and litter | (4) | 9,611 | Singapore 9,604. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 1,797 | 629 | Singapore 503; Sri Lanka 112; Kuwait 9. |
| Refinery products: | | | |
| Gasoline, motor spirit do | 72 | 87 | Singapore 72; Iran 3. |
| Kerosine and white spirit do | 2,202 | 1,133 | Singapore 618; Saudi Arabia 216; Iran 121. |
| Distillate fuel oil do | 2,065 | 991 | Singapore 988. |
| Residual fuel oil do | | 4,541 | Singapore 2,230; Pakistan 1,981; Kuwait 207. |
| Lubricants (including grease) do | 168 | 179 | Singapore 88; United States 54; Japan 16. |
| Other: | | | |
| Liquefied petroleum gas do | -- | 39 | Singapore 38. |
| Mineral jelly and wax do | 19 | 32 | Netherlands 11; West Germany 8; People's Republic of China 5. |
| Nonlubricating oils, n.e.s do | 372 | 147 | Singapore 91; Japan 21; United States 11. |
| Bitumen and other residues and bituminous mixtures, n.e.s do | -- | 810 | Singapore 561; United States 160; Taiwan 33. |
| Pitch, pitch coke and petroleum coke do | -- | 53 | Mainly from Singapore. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 195,919 | 3,605 | Singapore 905; United Kingdom 868; People's Republic of China 571. |

NA Not available.
[1] Less than ½ unit.
[2] Includes artificial graphite.
[3] Includes peat.
[4] Included in coal.

## COMMODITY REVIEW

### METALS

**Aluminum.**—The State-owned mining enterprise, P.N. Aneka Tambang, is the only company mining bauxite in Indonesia. The ore from the Kijang mine on Bintan Island in the Riau Archipelago is exported to Japan. Ore shipped contains 52% to 53% $Al_2O_3$ and about 10% moisture. A contract signed late in 1973 between the Indonesian Government and Japanese aluminum companies, Sumitomo Chemical Co., Ltd., Nippon Light Metal Co., Ltd., and Showa Denko K.K., calls for an increase in bauxite shipped to Japan from the current 1.1 million to 1.3 million tons per year. The new contract calls for shipments through 1983 instead of the originally planned 1978 expiration. Reserves of higher grade ore are limited and the company has been exploring and developing reserves of lower grade ore. A study for the construction of an alumina plant, in partnership with a group of Japanese aluminum producers, has been going on since 1972. The project would involve an investment of $200 million to $300 million and the plant would have an annual capacity of about 350,000 to 400,000 tons of alumina. Reportedly this alumina would be smelted in the Asahan complex when completed.

P.T. Alcoa Minerals of Indonesia (ALCOMIN) a wholly-owned subsidiary of the Aluminum Company of America (Alcoa), has confirmed bauxite reserves in Western Kalimantan large enough to support an alumina plant. The original 525 million hectare ALCOMIN contract area has been reduced to 1.3 million hectares. The ALCOMIN project is expected to process over 2 million tons of bauxite per year to produce 800,000 tons of alumina.

It appears that an argeement has been reached between the Japanese aluminum partners and the Indonesian Government regarding the Asahan River hydroelectric and aluminum refinery. The hydroelectric plant will have an initial capacity of 430,000 kilowatts and will be able to operate at a capacity of up to 644,000 kilowatts. The aluminum refinery, with a yearly output capacity of 225,000 tons, will be built in Kualatajun, 120 kilometers from the powerplant. It will be built in three stages each with a 75,000-ton output capacity. Production from the first stage is expected by 1982 and will be raised to 225,000 tons by 1984. Production may eventually be raised to 360,000 tons. Including construction cost of the powerplant, the entire cost of construction is estimated at $830 million. Preconstruction negotiation in the last part of the year should pave the way for signing of the formal contract between the two parties sometime in 1975.

**Copper.**—The third aerial tramline from Freeport Indonesia Incorporated's Ertsberg copper ore body to the 7,000-ton-per-day flotation mill was put in operation. Two of the three trams are used for ore and the third for personnel. With the new tram and improved crushing and flotation, the operation reached the designed capacity of 250,000 tons of concentrate per year. Japan was the principal consumer of Freeport's copper concentrate. Small amounts were shipped to West Germany.

P. N. Aneka Tambang was doing exploratory drilling for porphyry copper at Gunung Gebe (near Bogor), and geologic investigation in South Sumatra and West Kalimanta.

P.T. Tropic Endeavour Indonesia, a subsidiary of the Australian firm Endeavour Oil Company N.L., formed a partnership with P.T. Kennecott Indonesia to do geologic exploration for copper in Endeavour's Sulawesi Block 2 contracted area of exploration.

**Gold and Silver.**—The Indonesian Ministry of Mines announced that a group of foreign companies, one British and four Australian, applied to enter into joint ventures with Indonesian companies to explore for gold. The best exploration prospects were said to be in south Sumatra, West Java, and the central part of west Irian.

The only gold and silver production in Indonesia came from Aneka Tambang's two underground operations—Cikotok and Cipicung. Favorable gold prices have prolonged the life of these operations.

**Iron and Steel.**—The iron and steel industry in Indonesia was made up of small mills with a capacity range from 5,000 to 25,000 tons of product per year. The raw material, mostly local or imported scrap or ingot, was melted in 5- to 10-ton electric arc furnaces and cast into billet size ingots. These were processed into reinforc-

ing bars, strip, pipe, nail wire, and galvanized sheets. Domestic production of steel was capable of meeting 40% of domestic demand. Indonesia has no significant amount of high-grade iron ore or metallurgical coke for the establishment of a basic iron and steel industry.

With the proximity of Indonesia to the abundant supply of Australian iron ore and metallurgical coke, national policy was aimed at developing a basic iron and steel industry with imported raw materials.

The Gutehoffnungshütte Aktienverein unit of the West Germany company Ferrostahl AG planned to commence work on a DM300 million steel works in Indonesia. The proposal called for a 500,000-ton-per-year plant to be constructed 80 miles from Jakarta. Production was scheduled to commence in 2 years with an anticipated capacity of 1.2 million tons per year in 3 years. The steelworks will be managed by a joint group, 20% of which is owned by the West German firm and 80% by P. T. Krakatau Steel Co. of Indonesia a subsidiary of the State-owned enterprise Pertamina.

Nippon Steel Corporation and four other steelmakers and four trading firms have come to an agreement with Krakatau Steel to jointly establish a reversing mill with an annual production capacity of 300,000 tons of cold-rolled sheet. The location of the mill will be in the Meraku area of western Java. A joint firm set up by the Japanese and Indonesian partners will operate the mill after it is completed in 1977. Construction will begin when the Indonesian Government approves the project. The reversing mill has been under consideration for several years because the four galvanizing sheet producers in the country have had to import cold-rolled sheet from Japan. The reversing mill will enable Indonesia to use hot-rolled sheet in coil which is more reasonable in price than cold-rolled sheet. Eventually the mill is to be taken over by the proposed integrated steel mill project in western Java.

A pending agreement between the Japanese firm of Toshin Steel Co., Ltd., and an Indonesian company would establish a joint venture for a mill to produce bar steel with an initial capacity of 5,000 tons per month. The Japanese would supply 55% of the $6 million capital, and the Indonesian company would provide the remaining funds. The agreement also calls for a 50-ton open hearth furnace. Steel scrap for the open hearth would be imported from Australia by a subsidiary firm of Budi Darma.

Hojalata y Lámina, S.A. announced the sale of its patented HyL process to P. T. Krakatau Steel Co. A steel producing facility is expected to be erected near Jakarta and to be completed by 1976.

Aneka Tambang continues to mine titaniferous iron beach sands along the south coast of Central Java. The 10-year sale contract, with Nippon Kokan K.K., was in its 4th year. Production has not yet reached the planned 300,000 tons per year. Several direct reduction processes were under consideration by Aneka Tambang for these iron sand deposits.

**Manganese.**—All of the manganese production came from many small-government sponsored mines in Jogjakarta, west Java. Hand-sorting methods were used to separate manganese ore from the laterite in which it occurs. Of the many mines only two were in production. The West Java Mining Company in Bandung coordinated some of the sales and purchasing activities. Most of the 11,000 to 12,000 tons of yearly production went to Japan. A new prospect in northern Maluke was being considered for development.

**Nickel.**—Aneka Tambang was the only producer of nickel ores in Indonesia. The Pomalaa mine is located on South Sulawesi, near Kendari. Aneka Tambang's program included the production of ferronickel using the lower grade Pomella ores. Construction of a $32 million Japanese financed ferronickel plant was started, and production was expected sometime in 1976. The plant will produce 20,000 tons of ferronickel per year. Aneka Tambang was exploring other low-grade nickel deposits in Southeast Kalimantan.

P.T. International Nickel Indonesia (PT INCO), a subsidiary of the International Nickel Co. of Canada (INCO) with six Japanese partners, has initiated construction of mining and processing facilities to produce 75% nickel matte from the lateritic ores in its contract area near Soroako, Central Sulawesi. The output of the plant was committed to three of the Japanese partners for 15 years. Improvement of the pyrometallurgical process, to which the ores have been submitted, has permitted an upward revision of output projections from 30 to 35 million pounds of nickel content

annually. PT INCO employed more than 1,000 persons, almost all of them Indonesian citizens. This figure should peak at 1,300 in 1975 and stabilize at 1,100 when the plant is in production. PT INCO investment projections for phase one of the project were revised to $169 million from the original $135 million figure. The company was considering the possibility of expanding production of the second phase to a level of 90 million to 100 million pounds nickel content annually. Also hydroelectric potential was being considered as the project's energy source instead of petroleum. PT INCO held 18% of its original 6.6 million hectare contract area and was continuing its systematic exploration program on the remaining property.

About 700 miles to the northeast of Sulawesi, near Bird's Head of Irian Jaya, on Gag Island, P.T. Pacific Nikkel Indonesia has completed initial exploration and feasibility studies of its nickel-bearing laterite project. P.T. Pacific Nikkel (a consortium of United States Steel Corp., Internatio-Müller N.V., Koninklijke Nederlandsche Hoogovens en Stalfabrieken, N.V., Newmont Mining Corp., and Sheritt Gordon Mines Ltd.) has spent over $30 million since 1968 in developing this deposit. The refinery was expected to produce 100 million pounds of metallic nickel and a small amount of cobalt annually. The cost of the project was estimated at $700 million. Engineering, design, and procurement activities have been brought to the point where infrastructure and facility construction can readily be undertaken. The pace of the project has been slowed down because of high fuel prices, supply problems and finances needed for the project. However, construction on the site preparation continues. The Indonesian Government may decide to take an equity position in the venture, a development which would help resolve the complex financial problems inherent in a project of this magnitude.

Japanese ferronickel producers have agreed to increase the price they pay for nickel ore exported by Aneka Tambang from its deposit on Sulawesi Island. The price increase was 9.92 cents per kilogram of contained nickel in the ore. The grade of the ore under contract was 2.7% nickel. Actual shipments averaged about 2.4% nickel.

**Tin.**—The State-owned P.N. Tambang Timah was the only company that could market and produce metallic tin in the country. Three other companies have been permitted to obtain rights to explore and develop mineral resources on the basis of Contract of Work agreements. Of the three, P.T. Koba Tin is the only one which has started mining.

Most of the Indonesian tin was sold to Europe with small amounts going to Japan and the United States. Domestic consumption was less than 3%.

To provide a steady income, two-thirds of Timah production was marketed under long-term contracts and the remainder was sold on an individual basis for the best price. The company had 47 dredges. There were 34 bucket dredges ranging in size from 5 cubic feet to 18 cubic feet. The largest bucket, *Banka I,* is 18 cubic feet. The remaining 13 dredges were cutter suction dredges.

Timah has decided to proceed with the design and construction of *Banka II* which will supplant *Banka I* as the flagship of Indonesia's tin-dredging fleet. It was scheduled for operation in 1977. W. Payne & Son, the British consulting firm, was designing the dredge. This same firm designed the *Banka I* dredge.

*Banka II* will be able to dredge to a depth of 50 meters below the waterline, with buckets of 22-cubic-foot (625-liter) capacity. Based on a 600-hour working month and dredging at 75% capacity, the *Banka II* will have an approximate throughput of 575,000 cubic yards per month (about 6.9 million cubic yards per year). Although no cost figures have been made public of the anticipated cost of *Banka II,* it was expected to cost more than 2.8 million pounds sterling. The cost of the new dredge is expected to be financed completely by Timah.

Timah's 5-year exploratory program was successful. Sufficient ore reserves were found to extend the life of Timah's operation for an additional 20 to 30 years. Some of these reserves lie in water more than 60 meters deep. Timah's Peltin tin smelter at Mentok, Banka Island, which has never exceeded 65% of its designed annual capacity of 25,000 long tons, was being expanded. The new facilities will use conventional reverberatory stationary furnaces of Danish design. With the additional facilities, the smelter's capacity will be 28,000 long tons of tin per year by 1975.

P.T. Broken Hill Pty. Indonesia in their

Contract of Work in 1971 agreed to explore and evaluate the underground tin mine of Kelapa Kampit. Kelapa Kampit was flooded in 1942 during the Japanese occupation of Indonesia. Before it was flooded, it produced 2,000 tons of concentrates per year. Under the present program the mine was dewatered and part of the underground workings were rehabilitated. A sufficient number of workings have been started to feed a 100-ton-per-day pilot plant. Mining and bulk sampling for testing was scheduled for 1975.

## NONMETALS

**Cement.**—Because of the rapidly rising demand for cement, Kaiser Cement & Gypsum Corp. and its Indonesian affiliate, Cibinong Cement Co., were planning to expand their partially completed cement plant near Bogor in West Java to about 1 million tons per year. Completion of the plant was scheduled for 1977. The initial phase of the plant, under construction since 1973, was expected to be completed in the second half of 1975. The estimated cost of the first phase of the plant was $41 million. Kaiser Cement owns 51% of Cibinong Cement. International Finance Corp., P.T. Semen Gresik of Indonesia, Bamerical International Finance Corp. (a subsidiary of Bank America Corp.), and Private Investment Co. of Asia (PICA) are the other shareholders of Cibinong Cement.

There were three plants in production: Gresik at Surabaya; Padang in Central Sumatra; and Tonasa in South Sulawesi. Gresik was preparing to double its yearly capacity from 500,000 to 1 million tons within the next few years; Padang, from 220,000 tons to 330,000 tons by 1975; and Tonasa from 120,000 tons to 500,000 tons by 1978.

**Diamond.**—Almost all Indonesian diamonds were mined in Kalimantan from alluvium by individuals who used mainly hand-panning methods. They sold through unofficial channels to foreign buyers.

Aneka Tambang has been exploring the alluvial deposits at Talang Intam Cempaka Putih, South Kalimantan. Results during the past 5 years have not been favorable. Consideration was being given to ending this program.

The only foreign private venture in diamond mining, P.T. Asia Tigor, with a contract area in South Kalimantan, has reported no activity since signature of its contract in 1971.

**Fertilizers.**—The State-owned enterprise P.N. Pupuk Sriwidjaja (Pusri), producing triple superphosphate at Palembang, Southern Sumatra, has contracted with M. W. Kellogg Overseas Corp. to build a 1,000-ton-per-day urea plant. Contracts for fertilizer plant construction with Kellogg now total $150 million. M. W. Kellogg has already completed 660-tons-per-day ammonia and 1,150-tons-per-day urea facilities for Pusri.

**Other Nonmetallic Minerals.**—Other industrial minerals were chiefly mined on a small scale by small private or mixed enterprises for domestic use.

State-owned enterprises have a legal monopoly in the production of iodine and in the quarrying of marble. P.T. Kimia Farma, under Health Department authority, extracted small amounts of iodine from brines in Java, solely for the domestic market. Kimia Farma was reported to have submitted an application to the Capital Investment Coordinating Board to launch a joint venture with Japanese partners Mitsui & Co. and Ise Chemical Industries Co., Ltd. in the manufacture and marketing of iodine and derivatives. P. T. Marmer, under the Department of Industry, has been operating marble quarries in Kediri, East Java.

Phosphates were found in limestone caves in Java, and occurrences were recently reported in Kalimantan. The volcanos of Indonesia were the source of sulfur production averaging about 2,000 tons per year from small, scattered deposits. Volcanic trass was mined on a small scale in Java. Clay and kaolin occur on the tin islands and mainly supply the domestic ceramic industry. Kaolin production has averaged 26,000 tons per year. About 6,000 tons were exported. Timah was considering new ventures involving exploitation of kaolin for export and of clay for the domestic ceramics industry. Numerous small private mines on the tin-producing islands and on Java near Jakarta and Surabaya have produced about 55,000 tons per year of quartz sands for the domestic glass industry.

## MINERAL FUELS

**Coal.**—The 2-year agreement between N.V. Shell Mijnbouw of the Royal Dutch/

Shell group and the Indonesian Government's State coal mining enterprise P.N. Batubara signed in November 1973, called for $1 million per year for coal exploration in a 71,000-square-kilometer area in Ombilin coalfield in West Sumatra. Drilling which started in July was suspended in December because of near surface gas pocket blowouts. During this period 250 exploratory holes were drilled, some to a depth of 450 feet. Drilling of additional 500 to 600 holes was expected to be resumed in the first part of 1975 after installation of blowout arrestors. The exploration agreement called for relinquishment of 75% of the area by June 1, 1975, and an additional 15% by June 1981. Results have been encouraging enough for Shell to indicate that the deposit is large enough to sustain an operation of 25 million tons of coal per year. Shell was negotiating a profit-sharing contract for the development of the deposit.

Mining of Ombilin coal has been going on for over 50 years. Lack of markets and inaccessibility has limited production. The railroad that connects Ombilin and the western Sumatra seacoast port of Palembang is a narrow gauge cog railroad incapable of transporting any substantial tonnage of coal to markets. Upgrading this railroad has been deemed too costly and a slurry pipeline to the coast was under consideration.

Indonesia's second 5-year plan (1974–79) was to increase coal production and to encourage its substitution for domestic uses in place of higher priced oil and gas. Production for domestic uses will remain the responsibility of Batubara while two foreign-owned companies now active in coal exploration, Rio Tinto-Bethlehem and Shell, will develop large-scale operations for export.

**Petroleum.**—Indonesia was the tenth largest crude oil producer among the market economy countries of the world. Its low-sulfur crude was in demand by two major industrial nations, Japan and the United States. Four percent of U.S. oil imports were from Indonesia. The oil policies of Indonesia influenced the development of oil industries in other Southeastern Asian countries as a result of the success of the Production Sharing Contracts pioneered by Pertamina, the State-owned oil company.

Petroleum exploration and development expenditures were increased from about $78 million in 1969 to an estimated $546 million in 1974. This high level of expenditure was expected to continue to increase and will undoubtedly result in additional discoveries, rivaling those already discovered. Indonesia exported 71% of its crude production to Japan, 22% to the United States, 5% to Trinidad, and 2% to other countries.

U.S. interests played a very important role in the development of Indonesia's petroleum sector. There were 25 U.S. oil companies in Indonesia. Of these companies, Caltex Petroleum Corp. accounted for over 70% of Indonesia's crude oil production.

Over 30 companies have signed agreements with Pertamina for exploration and production operations. Three Contracts of Work were signed prior to 1967 and 53 Production Sharing Contracts have been signed since then.

Indonesia's Production Sharing Contracts were an innovation in contractual relationships between a foreign company and a State enterprise. Under the contractual agreement Pertamina was to be capable of phased assumption of responsibility of management of the foreign oil company operations. Pertamina and the contracting companies shared the problems and benefits of their activities.

The Production Sharing Contract was working well in Indonesia and the principles of the agreement were being adopted by other countries in the world especially those in Southeast Asia.

The petroleum sector contributed about 7% to Indonesia's gross national product and accounted for about half of its gross export earnings and a very substantial part of its total investment expenditures. As a result of increasing production, rising prices, and modification of Work and Production Sharing Contracts, the Government's gross foreign exchange from oil exports are expected to increase more than 200%. The net foreign exchange earnings should increase about 375%.

Foreign oil contractors spent about $550 million in 1974 on oil exploration and production. It was estimated that the oil industry will spend $55 billion in Asia between 1975–85 compared with $23 billion in the Middle East. Pertamina's budget for 1974–75 was estimated at $1.7 billion. During the past year over 200 exploratory wells were completed. This was about 23% more

than in the previous year. Footage drilled increased 34%. Extension and development drilling was completed on 449 wells. Pertamina reported 50 oil and gas discoveries giving a 25% success ratio. Of the various discoveries, 28 were oil, 19 were gas, and 3 were oil and gas discoveries. Indonesian oil reserves were estimated to be about 12 billion to 15 billion barrels.

The high success ratio, the workability of the Production Sharing Contract, the low sulfur content of the crude, increasing energy demand, and high oil and gas prices will keep the foreign oil company interests high in Indonesia. Although millions of square miles of onshore and offshore areas, representing about 90% of the oil-prospecting area, have been allocated to various companies, only about 10% of the area has been explored. Of the total 5.1 million square kilometers of the prospecting area about 1.7 million square kilometers (33%) is located onshore and 3.4 million square kilometers (67%) is offshore.

Pertamina has signed a Production Sharing Contract with Sun Oil Company (Sunoco) for a 16,360-square-kilometer area in the northwestern part of Irian Jaya just north of Bintuni Bay. The contract called for Sunoco to relinquish approximately two-thirds of the area over the first 10 years and make an $11 million exploration expenditure over an 8-year period. The contract also called for a 65% Pertamina, and 35% Sunoco oil production split of up to 75,000 barrels per day. After Sunoco's production exceeds 75,000 barrels per day, they have agreed to invest in a refinery or a petrochemical plant. The agreement offers a 10% participation on a cost basis to Pertamina or an Indonesian party recommended by Pertamina. This made the 52d Production Sharing Contract that Pertamina has signed.

The 53d Production Sharing Contract was signed with Katy Industries, Inc. (KII), covering 6 million acres in Southeast Kalimanta. Katy Industries, Inc., announced that Union Oil, which will be the operator, acquired 80% of the company. This new contract has much more favorable terms for Pertamina than previous agreements. Pertamina was to receive a $10 million bonus for data and their signature, basic 70% to 30% production split in favor of Pertamina, up to 80% to 20% split when production exceeds 300,000 barrels per day, and relinquishment of almost 80% of the area at the end of 10 years.

Phillips Petroleum Co. discovered a new oil well which produced 12,000 barrels of crude per day in the Berau Gulf, West Irian. Pertamina and the Continental Oil Co. group discovered an offshore oil and gas deposit in 267 feet of water and 220 miles east of Natuma Islands in the South China Sea. The well named Trubuk 2 produced 24 million cubic feet of gas and 4,320 barrels of oil per day. Atlantic Richfield Co., operator for a group of American companies, in association with Pertamina, announced the discovery of an oil and gas find 100 miles northwest of the Ardjuna Field and 70 miles northwest of Jakarta offshore in the Java Sea. The oil zone is between 3,200 and 3,600 feet in depth. From one zone gas flowed at rates from 8.2 million to 11.6 million cubic feet per day. Below the 3,600-foot level two other intervals produced oil and gas at lower flow rates.

Union Oil Company of California, in association with Pertamina, discovered a new oilfield and gasfield 7 miles off the coast of Balikpapan, East Kalimantan. Oil flow was about 7,700 barrels per day and gas was about 21 million cubic feet per day.

Asian American Exploration Refining Association (Asamera) announced that a well drilled in the east flank of its new Tualang oilfield in Northern Sumatra has resulted in a new field discovery. The well showed four producing zones.

Japanese Petroleum Exploration Co., Ltd. (JAPEX), and Total Indonesie announced a new gas discovery in the Mahakam area offshore east of Kalimantan. The exploratory well, Tambora No. 1, tested 21 million cubic feet of gas per day. The flow came from two separate zones below 2,700 meters.

A liquefied natural gas (LNG) plant was planned to use the oil and gas from the Arjuna oilfield. The plant's production capacity was expected to be 25,000 barrels per day. The natural gas from the field also was planned to be used as fuel for the 2-million-ton direct reduction steelmaking facility at Cilegon. The 24-inch pipeline from the oilfield to Cilegon will cover a distance of 220 kilometers and will cost about $200 million. A Japanese consortium headed by Nippon Steel Corporation has reportedly signed the contract to construct the pipeline. Now under construction, the

pipeline was scheduled for completion by the end of 1976.

Pertamina was planning to set up petrochemical facilities in Plaju and Sungaigerong. The products will be synthetic fibers and other materials for making textiles. The anticipated cost of the plant was $500 million. Construction will be undertaken by the Commonwealth Oil and Refining Company of Puerto Rico.

# The Mineral Industry of Iran

By Bernadette Michalski [1]

The fourfold increase in petroleum prices that evolved in late 1973 had an overwhelming impact on the Iranian economy in 1974, the first full year of the $11.88 and $11.64 per barrel posted prices for Iranian crude. Government revenues realized from the production and sale of hydrocarbons leaped to $18 billion [2] in the Iranian year 1353 (March 1974 to March 1975) as compared with revenues exceeding $4 billion in the previous 12-month period.

With additional revenues in the form of petrodollars at its disposal, the Government of Iran undertook a revision of the Iranian Fifth National Development Plan covering the period from March 1973 to March 1978. The revised plan provides a firm financial basis for industrial diversification by allotting $70 billion for development, a figure nearly double the original allotment. Under the revised plan, nearly $12 billion was allocated for the petroleum and natural gas industries; $6 billion for metal refining and petrochemicals industries; and $1 billion for mining industries, particularly development of the Sar Cheshmeh copper deposit and the Gol-e Gowar iron ore deposit. Mineral supporting industries such as transportation and power generation were allotted $7 billion for road, rail, and port expansion and $4.6 billion for construction of power generation and distribution facilities.

During the year, the Government of Iran entered into massive purchasing contracts with France, the United Kingdom, and Italy. The combined contracts approached $8 billion in value. The largest transaction, valued at $5 billion, was concluded with France and included the purchase and installation of five nuclear powerplants, construction of a steel plant, and construction of petroleum and natural gas pipelines.

Additional petrodollars were channeled to Western Europe by Iran's purchase of approximately one-quarter interest in a major steel firm, the Friedrich Krupp Hüettenwerke AG (West Germany). Throughout 1974, Iran continued to exert its influence as a member of the Organization of Petroleum Exporting Countries (OPEC) for additional petroleum price increases to sustain its ambitious investment and development program.

## PRODUCTION

According to the National Iranian Oil Co. Ltd. (NIOC), crude petroleum production was valued at an estimated $26 billion dollars. Although petroleum operations dominated Iran's mineral industry, the Nation produced a variety of minerals as indicated in table 1. The significant increases reported in the production of most metal and construction materials were the result of continued government efforts to encourage development of a diversified economy. Aluminum production is based on reduction of imported alumina. Other primary metal production was derived from indigenous ores in 1974.

[1] Mineral specialist, Division of Petroleum and Natural Gas.

[2] Where necessary, values have been converted from Iranian Rials (Rls) to U.S. dollars at the rate of Rls67.50=US$1.00.

## Table 1.—Iran: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity [1] | 1972 [2] | 1973 [2] | 1974 p [2] |
|---|---|---|---|
| **METALS** | | | |
| Aluminum, primary ingot | 6,500 | 33,700 | 49,000 |
| Chromium, chromite, gross weight | r 200,000 | 140,000 | 175,000 |
| Copper: | | | |
| Mine output, metal content | 1,200 | 3,000 | 1,800 |
| Smelter output [3] | 4,000 | e 4,500 | e 4,000 |
| Refinery output e | 1,000 | 1,000 | 1,000 |
| Iron and steel: | | | |
| Iron ore, gross weight thousand tons | 98 | 850 | 1,000 |
| Pig iron do | r e 550 | 400 | 1,500 |
| Steel, crude do | -- | 200 | 210 |
| Lead: | | | |
| Mine output, metal content | r 43,500 | 83,000 | 60,000 |
| Smelter output e | 190 | 200 | 210 |
| Manganese ore, gross weight | 20,000 | 22,000 | 30,000 |
| Zinc, mine output, metal content | 52,250 | 82,500 | 110,000 |
| **NONMETALS** | | | |
| Barite | 80,000 | 95,000 | 200,000 |
| Cement, hydraulic thousand tons | r 3,372 | 3,489 | 5,000 |
| Clays: | | | |
| Bentonite | 18,000 | 35,000 | 50,000 |
| Fire clay | 5,500 | 31,000 | NA |
| Kaolin | 55,000 | e 80,000 | e 100,000 |
| Fertilizer materials, manufactured, gross weight | 351,000 | e 436,000 | e 450,000 |
| Gem stones, turquoise, crude | 70 | 70 | 70 |
| Gypsum thousand tons | 2,400 | 3,000 | 4,000 |
| Lime e do | 1,000 | 1,000 | 1,000 |
| Magnesite | r 16,000 | 16,000 | 16,000 |
| Pigments, mineral, natural | 12,500 | 5,500 | 5,000 |
| Salt: | | | |
| Rock thousand tons | 350 | 350 | 400 |
| Evaporation do | 50 | -- | -- |
| Total do | 400 | 350 | 400 |
| Stone, sand and gravel: | | | |
| Limestone do | 5,200 | 250 | 300 |
| Marble do | 18 | 18 | 25 |
| Silica do | 50 | 70 | 90 |
| Travertine do | 150 | 150 | 180 |
| Strontium minerals, celestite e | 300 | 300 | 300 |
| Sulfates, natural: | | | |
| Aluminum-potassium sulfate (alum) | 300 | NA | NA |
| Sodium sulfate (mineral not specified) | 18,000 | 18,000 | 25,000 |
| Sulfur: | | | |
| From ores (refined) | 3,000 | 20,445 | e 20,000 |
| Elemental, byproduct | 665,707 | 563,487 | 595,000 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Coal thousand tons | 1,000 | 1,100 | 1,200 |
| Coke e do | 400 | 400 | 400 |
| Gas, natural: | | | |
| Gross production million cubic feet | 1,469,730 | 1,698,691 | 1,766,721 |
| Marketed production do | 447,908 | 701,678 | 787,360 |
| Natural gas liquids: | | | |
| Propane thousand 42-gallon barrels | r 4,381 | 5,256 | NA |
| Butane do | 3,639 | 5,000 | NA |
| Natural gasoline and other do | 3,983 | 5,132 | NA |
| Total do | r 12,003 | 15,388 | 16,482 |
| Petroleum: | | | |
| Crude (net) [4] do | 1,838,825 | 2,139,269 | 2,197,700 |
| Refinery products: | | | |
| Gasoline: | | | |
| Aviation do | 5,630 | 5,217 | 4,908 |
| Motor do | 21,344 | 21,748 | 23,458 |
| Jet fuel do | 13,282 | 13,157 | 12,541 |
| Kerosine do | 23,977 | 20,506 | 22,051 |
| Distillate fuel oil do | 36,124 | 38,986 | 41,175 |
| Residual fuel oil do | 83,741 | 88,224 | 97,901 |
| Lubricants do | 546 | 1,077 | 601 |
| Other: | | | |
| Liquefied petroleum gas do | 865 | 2,299 | 2,621 |
| Naphtha and solvents do | 4,105 | 3,026 | 5,877 |

See footnotes at end of table.

Table 1.—Iran: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 [2] | 1973 [2] | 1974 [p 2] |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Petroleum—Continued | | | | |
| Refinery products—Continued | | | | |
| Other—Continued | | | | |
| Asphalt | thousand 42-gallon barrels | 1,684 | 3,159 | 3,752 |
| Unspecified | do | 8,390 | 3,020 | 2,313 |
| Refinery fuel and losses | do | 4,376 | 13,840 | 12,811 |
| Total | do | 204,064 | 214,259 | 230,009 |

e Estimate. p Preliminary. r Revised. NA Not available.
[1] In addition to the commodities listed, other types of crude construction materials (such as common clays, sand, and gravel, and other varieties of stone) are also produced, but output is unreported and available information is inadequate to make reliable estimates of output levels.
[2] Data presented are for Iranian calendar years beginning March 21 of the year stated, except for figures on natural gas, natural gas liquids, and petroleum, which are for regular calendar years.
[3] As reported in Iranian sources; apparently includes secondary copper.
[4] Excludes petroleum produced but reinjected into fields.

## TRADE

Export receipts and import payments for the Iranian year 1353 (March 1974 to March 1975) resulted in a record surplus of $8.2 billion. Petroleum exports accounted for more than 90% of total receipts. Iran ranked second among the leading world petroleum exporting countries. Crude oil exports averaged 5.37 million barrels per day in calendar 1974, a slight increase from the 5.28 million barrels per day in calendar 1973. The per barrel posted price for Iranian light crude (34° API gravity) was $11.875 from January to November and was reduced to $11.475 on November 1 to yearend. The posted price for Iranian heavy crude (31° API gravity) was $11.635 from January to November and was reduced to $11.235 on November 1 to yearend.

Table 2.—Iran: Exports of mineral commodities [1]
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, all forms | 2,556 | 20,519 | Japan 17,317. |
| Arsenic ores and concentrates | -- | 11 | Mainly to Syria. |
| Chromium, chromite, 48% $Cr_2O_3$ | 101,105 | 150,811 | France 50,311; People's Republic of China 46,550; Japan 20,900. |
| Copper ore and concentrate | 660 | 1,103 | All to Japan. |
| Iron and steel: | | | |
| Iron ore and concentrate | -- | 1,400 | All to United Arab Emirates. |
| Scrap | 84 | 101 | Japan 65; Bahrain 34. |
| Semimanufactures | 1,966 | 2,253 | Saudi Arabia 967; Kuwait 909. |
| Lead: | | | |
| Ore and concentrate | 66,766 | 88,764 | U.S.S.R. 55,650; Belgium 13,283; Japan 11,031. |
| Metal and alloys, all forms | -- | 627 | Japan 457; Kuwait 125. |
| Manganese ore and concentrate | 9,652 | -- | |
| Zinc: | | | |
| Ore and concentrate | 95,378 | 72,355 | Japan 19,500; U.S.S.R. 15,535; United Kingdom 12,200. |
| Oxide | -- | 100 | All to Belgium. |
| Metal and alloys, all forms | -- | 20 | All to United Kingdom. |
| Other: | | | |
| Ore and concentrate, n.e.s | 501 | -- | |
| Ash and residue containing nonferrous metals | 225 | 1 | All to Kuwait. |
| NONMETALS | | | |
| Abrasives, natural: | | | |
| Crude, n.e.s | 90 | 223 | All to United Arab Emirates. |
| Grinding and polishing wheels and stones | 4 | 306 | Kuwait 272. |
| Barite, natural | 9,205 | 1,444 | All to United Arab Emirates. |
| Cement | 24,104 | 6,500 | Saudi Arabia 4,500; Kuwait 2,000. |
| Chalk | 20 | 21 | Afghanistan 19; United Arab Emirates 2. |

See footnotes at end of table.

Table 2.—Iran: Exports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Clays and clay products: | | | |
| Crude clays, n.e.s.: | | | |
| Fuller's earth | 15 | 8 | Bahrain 6. |
| Kaolin | 5 | | |
| Other | 2,011 | 10,601 | Kuwait 3,612; U.S.S.R. 4,275. |
| Products: | | | |
| Refractory | 308 | 291 | United Arab Emirates 288. |
| Nonrefractory | 180 | 5,012 | U.S.S.R. 4,991. |
| Diatomite | -- | 2 | All to United States. |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous | 31 | 6 | All to Kuwait. |
| Phosphatic | 17,000 | [2]16,018 | Mainly to South America. |
| Potassic | -- | 18 | All to Kuwait. |
| Other | 10 | 238 | Oman 170; Kuwait 63. |
| Ammonia | 90,000 | 96,005 | United Kingdom 48,000; Netherlands 48,000. |
| Gypsum | 2,004 | 4,195 | U.S.S.R. 3,118; Kuwait 585. |
| Lime | -- | ([3]) | All to Afghanistan. |
| Magnesite, crude | -- | ([3]) | All to Bahrain. |
| Mica | -- | 1 | All to Kuwait. |
| Pigments, natural, mineral | 10,259 | 1,502 | France 1,500. |
| Precious and semiprecious stones: | | | |
| Turquoise, raw, cut and uncut grams | 1,134,472 | -- | |
| Other | 110,900 | 776,279 | Oman 880; United States 704. |
| Salt | 2,139 | 2,513 | Oman 956; Bahrain 469; United Arab Emirates 433. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Alabaster | 907 | -- | |
| Marble | 28,998 | 45,763 | Italy 28,393; Kuwait 5,116; Japan 4,164. |
| Other | 11,727 | 67 | United Arab Emirates 60; Republic of South Africa 7. |
| Worked: | | | |
| Slate | 18 | 540 | Kuwait 512. |
| Other | 47 | 4,385 | Kuwait 2,100; Oman 2,000. |
| Gravel and crushed stone | 42,191 | 47,788 | Kuwait 27,067; Oman 8,912; People's Republic of China 6,400. |
| Limestone and dolomite | 1,600 | 75 | United Arab Emirates 67; Hong Kong 7. |
| Quartz | 3 | -- | |
| Sulfur and pyrite: | | | |
| Pyrite, unroasted | -- | 21 | Bahrain 19; Iraq 2. |
| Refined | 488,898 | 309,223 | Singapore 100,000; India 86,409; Republic of South Africa 70,117. |
| Other crude nonmetals, meerschaum and amber, unspecified | ([3]) | ([3]) | All to United Arab Emirates. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal, lignite and coking coal | 52 | 325 | Kuwait 295; Oman 30. |
| Gas, natural ____ million cubic feet | 200,670 | [2]29,142 | All to Asia. |
| Petroleum: [2] | | | |
| Crude thousand 42-gallon barrels | 1,598,046 | 2,008,971 | Europe 877,139; Asia 770,599. |
| Refinery products: | | | |
| Gasoline: | | | |
| Aviation ____ do ____ | 5,299 | | |
| Motor ____ do ____ | 17,346 | 18,925 | Asia 7,351; Europe 4,215. |
| Kerosine ____ do ____ | 2,958 | | |
| Jet fuel ____ do ____ | 6,417 | 11,605 | Asia 3,970; Africa 3,810. |
| Distillate fuel oil ____ do ____ | 15,063 | 56,881 | Asia 24,143; Europe 18,653. |
| Residual fuel oil ____ do ____ | 73,808 | 38,267 | Asia 15,964; Europe 12,223. |
| Lubricants ____ do ____ | 1 | 6 | All to Asia. |
| Other: | | | |
| Liquefied petroleum gas do ____ | 7,690 | 8,369 | Mainly to Asia. |
| Solvents ____ do ____ | 717 | -- | |
| Asphalt and bitumen do ____ | 132 | 121 | All to Asia. |
| Unspecified ____ do ____ | NA | 119 | Do. |
| Total ____ do ____ | 129,431 | 134,293 | |

NA Not available.
[1] Data are for Iranian calendar years beginning March 21 of the year indicated.
[2] Destinations of shipments reported by continent only in most cases; detail by country not available except as shown.
[3] Less than ½ unit.

## Table 3.—Iran: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Oxide and hydroxide | | 47,510 | 452 |
| Metal including alloys: | | | |
| Scrap | | 186 | 5 |
| Unwrought | | 10,131 | 339 |
| Semimanufactures | | 6,117 | 9,610 |
| Antimony metal including alloys, all forms | | 10 | -- |
| Arsenic trioxide, pentoxide and acids | | 5 | 112 |
| Cadmium metal including alloys, all forms | kilograms | 1,357 | -- |
| Chromium: | | | |
| Oxide and hydroxide | | 8 | 132 |
| Metal including alloys, all forms | | 118 | -- |
| Cobalt: | | | |
| Oxides and hydroxides | | -- | 543 |
| Metal including alloys, all forms | | 1,513 | -- |
| Copper metal including alloys: | | | |
| Scrap | | 677 | 284 |
| Unwrought | | 505 | 83 |
| Semimanufactures | | 14,255 | 16,473 |
| Gold metal, all forms | troy ounces | 50,059 | 16,847 |
| Iron and steel metal: | | | |
| Scrap | | 12,525 | 15,084 |
| Cast iron | | 4,756 | 13,300 |
| Ferroalloys | | 5,225 | 22,090 |
| Steel, primary forms | | 288,254 | 254,473 |
| Semimanufactures | thousand tons | 1,314 | 25,631 |
| Lead: | | | |
| Oxide | | 667 | 149 |
| Metal including alloys: | | | |
| Scrap | | 8 | 1,101 |
| Unwrought | | 2,098 | 2,682 |
| Semimanufactures | | 84 | 1,345 |
| Magnesium metal including alloys, all forms | | 94 | -- |
| Manganese: | | | |
| Ore and concentrate | | -- | 20 |
| Oxide | | 1,297 | 1,888 |
| Mercury | 76-pound flasks | 516 | 661 |
| Nickel metal including alloys: | | | |
| Scrap | | (2) | 5 |
| Unwrought | | 35 | 34 |
| Semimanufactures | | 150 | 157 |
| Platinum metal including scrap, waste and ash | troy ounces | 482 | 119 |
| Silver metal including scrap, waste and ash | do | 398,958 | 874,599 |
| Tin: | | | |
| Oxide | long tons | 5 | 16 |
| Metal including alloys: | | | |
| Scrap | do | (2) | 6 |
| Unwrought | do | 321 | 554 |
| Semimanufactures | do | 407 | 203 |
| Titanium oxide | | 3,247 | 1,369 |
| Tungsten metal including alloys, all forms | | 4 | 38 |
| Zinc: | | | |
| Oxide | | 917 | 988 |
| Metal including alloys: | | | |
| Scrap | | 8 | 129 |
| Unwrought | | 4,794 | 6,822 |
| Semimanufactures | | 228 | 147 |
| Other: | | | |
| Ore and concentrate, n.e.s | | 1,272 | 600 |
| Ash and residue containing nonferrous metals | | 180 | 336 |
| **NONMETALS** | | | |
| Abrasives, natural: | | | |
| Crude, n.e.s | | 149 | 162 |
| Grinding and polishing wheels and stones | | 1,027 | 1,242 |
| Asbestos | | 12,773 | 15,462 |
| Barite | | 1,023 | 23 |
| Cement | | 57,964 | 30,775 |
| Chalk | | 347 | 1,422 |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Fire clay | | 3,641 | 8,717 |
| Kaolin | | 9,482 | 13,194 |
| Pozzolana and similar earths for cement manufacture | | 13 | -- |
| Drilling mud | | 4,025 | 18,883 |
| Other | | r 822,780 | -- |

See footnotes at end of table.

## Table 3.—Iran: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Clays and clay products (including all refractory brick)—Continued | | | |
| Products: | | | |
| Refractory (including nonclay bricks) | | 14,949 | 45,290 |
| Nonrefractory | | 15 | 214 |
| Diatomite | | 755 | -- |
| Fertilizer materials: | | | |
| Crude, phosphatic | | -- | 141,356 |
| Manufactured: | | | |
| Nitrogenous | | 85,094 | 89,404 |
| Phosphatic, including Thomas slag | | 68,891 | 232,525 |
| Potassic | | -- | 51 |
| Other, including mixed | | 2,067 | 89 |
| Ammonia | | 294 | 75 |
| Graphite | | 2,087 | 1,901 |
| Gypsum | | 942 | 275 |
| Iodine and bromine | | -- | 135 |
| Lime | | 538 | 166 |
| Magnesite | | 521 | 18,833 |
| Mica: | | | |
| Crude | | 347 | 1,819 |
| Worked | | 319 | |
| Pigments, mineral: | | | |
| Natural, crude | | 464 | 1,901 |
| Iron oxides, processed | | 31 | 927 |
| Precious and semiprecious stones: | | | |
| Natural | grams | 1,939,803 | 2,512,970 |
| Manufactured | do | 22,900 | 657,428 |
| Salt | | 39 | 7 |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | | 58 | 85 |
| Worked: | | | |
| Slate | | (2) | -- |
| Other | | 20 | 6 |
| Crushed stone | | 429 | 658 |
| Limestone | | 1,878 | 678 |
| Quartz | | 797 | 1,212 |
| Sand and gravel | | 10,114 | 12,042 |
| Sulfur: | | | |
| Elemental | | 347 | 95 |
| Sulfuric acid | | 59 | 85 |
| Sulfur dioxide | | -- | 5,255 |
| Talc, steatite, soapstone, pyrophyllite | | 389 | 338 |
| Other nonmetals, n.e.s.: | | | |
| Crude, meerschaum, amber, jet | | -- | 74 |
| Oxides and hydroxides: | | | |
| Magnesium | | 208 | 618 |
| Barium | | 585 | |
| Other | | 2,337 | 754 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt, natural | | 14 | 2,020 |
| Carbon black | | | 5,805 |
| Coal, including briquets | | 2,401 | 50,683 |
| Coke | | -- | 10,832 |
| Rare gases, including neon | | 112 | 444 |
| Petroleum refinery products: | | | |
| Gasoline | 42-gallon barrels | 8,546 | -- |
| Distillate fuel oil | do | 10 | 185 |
| Lubricants | do | 175,376 | 110,775 |
| Other: | | | |
| Liquefied petroleum gas | do | 350 | 23 |
| Mineral jelly and wax | do | 38,044 | 18,439 |
| Asphalt and bitumen | do | 28,082 | 14,045 |
| Solvents | do | 37,883 | -- |
| Unspecified | do | 4,805 | 2,030 |
| Total | do | 293,006 | 145,497 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | 1,051 | 2,343 |

r Revised.
[1] Data are for Iranian calendar years beginning March 21 of the year indicated.
[2] Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Aluminum.**—The Arak smelter Iran's sole aluminum producing facility, operated at full capacity yielding about 49,000 tons of aluminum ingot in 1974. The smelter is owned by the Iranian Aluminium Co. (IRALCO). The Iranian Government holds 82.5% interest in IRALCO with Reynolds International, Inc. (United States) holding 12.5% interest and the Pakistani Government holding the remaining 5% interest.

The Arak smelter is now under an expansion program designed to raise capacity to 120,000 tons by 1976. Raw material for the smelter is imported alumina from Australia. Any additional expansion of aluminum smelter capacity in Iran is related to expansion of Australian alumina plant capacity. As of yearend, several investment ventures in Australian bauxite-alumina operations have been stalemated because of Australian foreign investment regulations requiring that a percentage of new foreign investments be deposited in no-interest-bearing accounts in the Central Bank of Australia.

**Chromite.**—Chromite production reached 175,000 tons containing an average of 48% $Cr_2O_3$. Three chromite deposits are believed to be currently under exploitation: Cheshmeh Bid, Khajeh Jamali, and Neyriz. Iran's chromite reserves are reported at 7 million tons averaging from 35% to 50% $Cr_2O_3$.

**Copper.**—Development of the Sar Cheshmeh deposit continued, and by yearend, overburden stripping had commenced. An estimated total of 40 million tons of overburden is scheduled for removal by 1976, followed by ore extraction at the rate of 42,000 tons per day yielding an estimated 145,000 tons of metal per year. The Ministry of Industry and Mines reported that the original reserve of 400 million tons of ore averaging 1.2% copper content is conservative, and Sar Cheshmeh ore reserves are now estimated to be near 800 million tons. Once production from this deposit is realized, Iran will reverse its position from net copper importer to major copper exporter.

Development work continued on the Qaleh Zari deposit where reserves reportedly total 2 million tons of ore containing 3% to 4% copper. Mine and concentrator operation is scheduled for early 1976 and to attain the full designed yearly capacity of 5,000 tons of copper in concentrate by yearend.

**Iron Ore.**—Approximately 1 million tons of iron ore is mined yearly from the Bafg deposit in central Iran for use in the Aryamehr iron and steel complex. Development of a second major iron ore deposit came closer to reality with the announcement that a $110 million contract was awarded by the National Iranian Steel Industries Corp. (NISIC) to Gränges International Mining Co. (Sweden) for mine and concentrator operation at the Ghol-e Gowar deposit. Mine production is scheduled for 1978 at a yearly rate of 5 million tons of ore that will yield 3 million tons of concentrate suitable for direct reduction.

In addition to defining and developing domestic iron ore reserves, NISIC entered a preliminary agreement with the Indian Government involving the investment of $350 million petrodollars in the development of the Kudremukh iron ore deposit in India. Reserve estimates for the deposit range from 600 million to 3 billion tons of ore containing 35% to 39% Fe. Development plans include mining 20 million tons of ore per year, which will be concentrated at the mine to 66%–67% Fe content. The concentrate will be hydraulically transported a distance of 38 miles to the expanded port of Mangalore, India for shipment to Iran. Mine development and port expansion activities should be completed in 1978.

At yearend NISIC entered into a $100 million contract with Lurgi-Chemie and Hüttentechnic GmbH (West Germany) for construction of a 5-million-ton-per-year-capacity pelletizing plant at Ahwaz by 1977.

**Iron and Steel.**—The Aryamehr iron and steel complex at Isfahan accounted for virtually all of Iran's crude steel output. During the year, an agreement was signed with the U.S.S.R. for the eventual expansion of the complex from the present 750,000-ton-per-year capacity to 8 million tons. The expansion program was scheduled to increase yearly capacity to 1.9 million tons by 1978, to 4.0 million tons by 1981, and finally to 8 million tons by 1986.

With the exception of the Aryamehr complex, future steel production will be

derived from sponge iron produced by direct reduction of iron ore. Iron and steel complexes utilizing direct reduction methods are scheduled for Ahwaz, Bandar Abbas, Bushire-Kangan, and Isfahan. Yearly crude steel capacity based on direct reduction processes is scheduled to reach 9 million tons by 1980.

During 1974, a feasibility study was completed by Italy's Finsider for a 2-million to 3-million-ton-per-year capacity direct reduction plant at Bandar Abbas. A study for a million-ton-capacity direct reduction plant at Isfahan was near completion by British Steel Corp., and a feasibility study for a 2.5-million-ton-capacity plant at Bushire was launched by a West German consortium. Contracts for construction of direct reduction plants with a total 2.2-million-ton-per-year capacity were awarded in 1973.

The Iranian Government had not only taken major steps in developing a national steel industry significant by world standards, but also acquired equity interest in a leading West German steel firm. In mid-1974, the Iranian Government announced the purchase of 25.04% interest in Friedrich Krupp Hüettenwerke A.G.

**Lead and Zinc.**—Mine and concentrator expansion programs were underway during the year to support development of a domestic lead and zinc smelting industry by 1980. At least 15 mining companies are involved in production of lead-zinc ores. The largest group is Société Industrielle et Minière de l'Iran (SIMIRAN). The group's Angouran deposit contains reserves estimated at 7 million tons of ore averaging 21% Zn and 6% Pb. The mine is operated by Cherkate Sahami Calcimin for SIMIRAN. Ore production from open pit and underground workings at Angouran yielded approximately 50,000 tons of concentrate. A flotation plant of 1,000-ton-per-day capacity was under construction in 1974 with completion scheduled for 1975. This facility should double the capacity of concentrate production. Feasibility studies for construction of a 70,000-ton-per-year-capacity zinc smelter and a 20,000-ton-per-year-capacity lead smelter were underway. Another major deposit owned by SIMIRAN is located at Khusk. This deposit, containing a reserve estimated at 3 million tons, is operated by the Bafg Mining Co. Ore production approached 100,000 tons in 1974. The bulk of Iran's lead concentrate production and all of the zinc concentrate production continued to be exported; however, exports should be appreciably reduced by 1980 when proposed lead and zinc smelters are commissioned.

## NONMETALS

**Cement.**—Construction activity continued to place heavy demands on the nation's cement manufacturing industries. To meet these demands, expansion programs were underway at all existing plants and at least nine additional cement plants were in various stages of planning and construction. The 4,000-ton-per-day-capacity Abyek plant entered production in April. Additional capacity installed at the Kermanshah, Fars, Esfahan, and Mashad plants was available throughout the year making possible a 43% increase in cement production as compared with the 1973 production record. Cement imports for 1974 were estimated at 700,000 tons.

**Fertilizer Materials.**—During 1974 the Chemical Fertilizer Distribution Co. reported Iran's chemical fertilizer consumption at 650,000 tons of both domestically produced and imported fertilizers. This represented an increase of 35% over the 1973 consumption level. Much of Iran's chemical fertilizer needs are satisfied by products of the chemical complexes at Shahpur and at Shiraz. A partial list of product output from these complexes was reported for 1974 as follows, in tons:

| Shahpur | | Shiraz | |
|---|---|---|---|
| Ammonia | 170,000 | Ammonium nitrate | 30,000 |
| Ammonium phosphate | 170,000 | Nitric acid | 4,000 |
| Urea | 150,000 | Urea | 52,000 |
| Diammonium phosphate | 170,000 | Mixed fertilizer | 50,000 |

The National Petrochemical Co. of Iran (NPCI) announced its intention to double the capacity at the Shahpur complex by 1977. Expansion plans for the Shiraz complex were well underway in 1974 with the contract for construction of a 1,200-ton-per-day-capacity ammonia plant awarded to Humphreys & Glasgow Ltd. (United Kingdom) and a 1,500-ton-per-day urea plant contract awarded to Heurtey Ltd.

**Sulfur.**—The bulk of sulfur production is obtained through byproduct recovery operations at the Shahpur and Kharg chemical plants. Sulfur recovery capacity at Shahpur

was reported at 251,000 tons. Sulfur recovery capacity at the Kharg chemical plant was reported at 230,000 tons.

## MINERAL FUELS

**Carbon Black.**—The NPCI, in partnership with Cabot Corp. (United States), opened a 16,000-ton-per-year carbon black plant at Ahwaz in November. Plant production is to serve the Iranian market.

**Natural Gas.**—According to the National Iranian Gas Co. (NIGC), proven natural gas reserves exceed 500 trillion cubic feet affording Iran the second largest known gas reserves in the world. During 1974, discovery of a second large gas deposit in the Kangan region was announced by the European Group of Oil Cos. (EGOCO), a European consortium in joint venture with NIOC. Official reserve figures were not reported for the Kangan region.

Gross production of natural gas reached 1.77 trillion cubic feet in 1974, the bulk of which was derived from the former consortium agreement area in southern Iran where NIOC reported gross production at 1.64 trillion cubic feet for the year. Nearly a trillion cubic feet of gas was flared during the year; however, flared gas expressed as a percentage of total gas production was reduced to 56% in 1974 as compared with 59% in 1973. To take full advantage of abundant natural gas reserves, Iran will expand its natural gas based chemical industry, increase exports of natural gas in both gaseous and liquid forms, utilize gas in secondary recovery operations at the Khuzestan oilfields, and utilize gas in direct reduction of iron ore.

Two liquefied natural gas (LNG) projects are planned. The Kangan Liquefied Gas Co. (Kalingas) continued construction of a liquefaction plant at Dayyer, just west of Kangan. The plant will process 1.6 billion cubic feet of gas daily and should be completed by 1976. At yearend a letter of intent was signed by NIGC and an American-Belgian consortium for the construction of liquefaction facilities capable of processing 2 billion to 3 billion cubic feet of natural gas per day. Initial cost of the project including liquefaction plant, terminal facilities, and the purchase of 34 LNG tankers is estimated at $5.9 billion.

During 1974, 321 billion cubic meters of natural gas was transported to the U.S.S.R. via the Iranian Gas Trunkline (IGAT) connecting the southern gasfields with the U.S.S.R. at Astara. Negotiations continued on an agreement whereby Iran would supply an additional 475 billion cubic meters of natural gas per year to the Soviet border. Under a transit agreement, the U.S.S.R. would deliver the gas to the West German border. Germany would purchase 50% of the delivered gas; France and Austria would purchase the remainder.

**Natural Gas Liquids.**—Natural gas liquids (NGL) are extracted from associated gas produced from the Marun, Agha-Jari, and Ahwaz Fields. The feed gas and extracted NGL is reported as follows for 1974:

| Field | Feed gas (billion cubic feet) | NGL (thousand barrels) |
|---|---|---|
| Marun | 304 | 9,006 |
| Agha-Jari | 168 | 5,497 |
| Ahwaz | 104 | 1,979 |

**Nuclear Energy.**—During 1974, Iran established an Atomic Energy Agency to develop Iran's nuclear power program. Near yearend, an agreement was signed with France for the purchase of five nuclear reactors of a total capacity of 5,000 megawatts per year. At least two plants of 900-megawatt capacity each are to be built by Société Franco-Américaine de Constructions Atomiques (Framatome), a subsidiary of Creusot-Loire. Construction was to commence in 1975 with completion scheduled for 1982 and 1983.

**Petroleum.**—Exploration and development activities continued at an accelerated pace. Total footage drilled was 1,065,200 for 99 well completions as compared with 868,265 feet drilled for 73 well completions in 1973. Twenty-seven exploratory wells with a total footage of 241,200 were drilled in 1974 yielding four oil discovery wells and four gas discovery wells.

Iran revised its petroleum production goal from 8.6 million barrels per day in 1977 to 7.2 million barrels per day in 1978. A contributing reason for the downward revision is the tieup of drilling equipment and expertise in the vast gas injection program to be launched in 1975 in the southwestern oilfields. Petroleum production for 1974 exceeded a per day average of 6 million barrels representing

a production increase averaging 160,000 barrels per day as compared with that of 1973. Iran remained the second largest crude petroleum producer in the Middle East and the fourth largest producer in the world.

The bulk of Iran's petroleum production, or more than 5.5 million barrels per day, was recovered in southwestern Iran from onshore operations conducted by the Oil Service Co. of Iran (OSCO) under contract to NIOC. Twenty fields are connected to the OSOC production system. The largest of these fields is Marun, which yielded a yearly average of 1,050,000 barrels per day for 1974 and produced at the rate of 1,135,000 barrels per day at yearend. Production from Agha-Jari, the second largest field, continued to decline averaging 990,000 barrels per day in 1974 as compared with 1,025,000 barrels per day in 1973. Production from Gachsaran averaged 920,000 barrels per day in 1974. The Ahwaz-Asmari Field averaged 875,000 barrels daily for 1974; however, by mid-1975 the field was expected to yield well over 1 million barrels per day.

At yearend, NIOC announced that in 1975 a $500 million secondary recovery project would be launched. This project calls for the injection of 13 billion cubic feet of gas per day into six southwestern oilfields including the Gachsaran and Agha-Jari Fields. The project will hopefully boost recovery to 40% of the oil in place rather than the 20% to 30% recovery anticipated from primary depletion.

During 1974 four companies, each including a 50% equity held by NIOC, produced crude oil from offshore wells. The largest producer among these was the Lavan Petroleum Company (LAPCO), which produced an average of 195,000 barrels per day from its Sassan Field in the Persian Gulf, an increase of 6% over that of 1973. LAPCO development plans include production from the Bahram Field (formerly "W" structure) at 60,000 barrels per day by 1977.

The Iran Pan American Oil Co. (IPAC) produced a total average of more than 132,000 barrels per day from its Darius, Cyrus, and Fereidoon Fields. The Fereidoon Field, which entered production in August 1974, averaged 30,000 barrels per day for the last quarter. IPAC anticipates the production rate from Fereidoon at 150,000 barrels per day by 1976 with completion of a 47 development well schedule. IPAC's fourth field, the Ardeshir, should enter production in 1975 reaching productive capacity of 200,000 barrels per day by 1977 after completion of 90 development wells.

The Société Irano-Italiane des Pétroles (SIRIP) produced an average of 76,000 barrels per day in 1974. The Nowruz Field produced 34,000 barrels per day followed by the Hendijan Field at 22,000 barrels per day and the Bahregansar at 20,000 barrels per day. SIRIP's onshore discovery at Shurom has been confirmed as a commercial field.

Iranian Marine International Oil Co. (IMINOCO) produced an average in excess of 58,300 barrels per day. The Rakhsh Field supplied an average of 33,300 barrels per day, and the Rostam Field yielded an average 25,000 barrels per day.

Other companies that include NIOC 50% equity participation are the Iran Nippon Petroleum Co. (INPECO); Phillips Petroleum Co. Iran, operator with Cities Service Oil Co. and Continental Oil Co. (FILIRAN formerly CONIRAN); and Hormuz Petroleum Co. (HOPECO). Exploration and drilling activities continued in concession areas held by these groups, but no production was reported. The Bushire Petroleum Co. (BUSHCO), a joint equity holding by Amerada Hess Corp. and NIOC, was dissolved at yearend abandoning its 1,200-square-mile offshore concession near the city of Bushire.

Iran exported most of its onshore crude production and all the crude production from offshore fields. Exports for 1974 averaged 5.37 million barrels per day or nearly 90% of total production. The remaining crude output, more than 630,000 barrels per day, was refined in Iran. The Abadan refinery, Iran's largest, recorded a throughput average of 446,000 barrels per day in 1974. More than half of the refinery's output was exported. Expansion plans increasing Abadan capacity to 1.5 million barrels per day have been announced. The additional capacity at Abadan is designed to service export markets. Studies continued on the proposed construction of several 500,000-barrel-per-day-capacity export-oriented refineries. As many as five such refineries are under consideration as joint venture operations between NIOC and Japanese, U.S., and West German investors.

**Errata—Please insert in bound edition of Volume III, Minerals Yearbook, 1974.**

# The Mineral Industry of Iraq

By John L. Albright [1]

The petroleum industry continued as the most important mineral industry in Iraq, and the Government's oil revenues soared to an estimated $6.5 billion [2] in 1974, compared with the previous year's $1.4 billion. Crude oil was produced by the Basrah Petroleum Co. Ltd. (BPC), the Iraqi Company for Oil Operations (ICOO), and the Iraq National Oil Company (INOC). During 1974 petroleum producing, refining, and exporting facilities were being enlarged and new industries, that would utilize petroleum and natural gas as fuel or feedstocks were being planned. Several foreign information sources estimated Iraq's proved crude oil reserves at 35 billion barrels, but Iraqi officials believed that proved reserves totaled 75 billion barrels, and that probable reserves may exceed 100 billion barrels. Reserves of natural gas were estimated to be about 27.5 trillion cubic feet.

A number of mineral industry projects were approved during the year, including the establishment of a petroleum technological institute in Al Basrah, construction of a large crude oil storage terminal at the port of Fao, and expansion of the sulfur-exporting terminal at Umm Qasr. Iraq also issued contracts to several French firms to construct a $700 million petrochemical complex near Al Basrah, which will produce ethylene, polyethylene, and polyvinyl chloride. Iraqi National Minerals Co. (INMC) signed a $550,000 contract with a Czechoslovakian firm to conduct a gravimetric survey of 45,000 square kilometers of the western desert areas, and Poland received a $9 million contract to establish a network of geodesic centers in Iraq.

In December, the Revolutionary Command Council reorganized several government ministries. The Ministry of Oil and Minerals was changed to the Ministry of Oil, and a new Ministry of Industry and Minerals was formed.

The Ministry of Transport invited bids to convert the Baghdad-Al Ma'qil railroad (near the port of Umm Qasr) from meter- to standard-gage track and approved the project to connect the line to the northern Baghdād-Al Mawsil railroad. Discussions were held with Syria on the project of extending the Syrian Ladhiqiyah-Qamishli railroad into Iraq. The project would connect Ladhiqiyah, on the Mediterranean Sea with Umm Qasr, on the Persian Gulf, stimulating trade between Iraq and Syria. In 1974, Iraq held discussions with Turkey concerning an international railroad between the two countries. The two governments agreed to study the feasibility of constructing a railroad link which would connect the Iraqi rail system with Iskenderun, Turkey, on the Mediterranean Sea.

## PRODUCTION

Crude oil production in 1974 totaled 720.7 million barrels (an average daily rate of 1.97 million barrels), down 19.9 million barrels or 2.7% from 1973. Iraq was the fourth largest oil producer in the Middle East and accounted for about 8.5% of the crude oil produced in the Middle East in 1974. The country planned to increase its oil output capacity to 3.5 million barrels per day in 1975 and to 6 million

[1] Mineral specialist (petroleum), Division of Petroleum and Natural Gas.

[2] Where necessary, values have been converted from Iraqi dinars (ID) to U.S. dollars at the rate of ID1.00=US$3.38.

barrels per day by 1981.[3] Contracts were signed with the U.S.S.R. for the third stage in the development of the North Rumaila oilfield.

**Table 1.—Iraq: Production of mineral commodities**

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| Cement, hydraulic [e] | thousand metric tons | [r] 1,900 | [r] 1,800 | 1,800 |
| Gas, natural: | | | | |
| Gross production | million cubic feet | 262,503 | 308,253 | [e] 300,253 |
| Marketed production | do | 32,995 | 42,731 | [e] 46,000 |
| Petroleum: | | | | |
| Crude | thousand 42-gallon barrels | 539,226 | 740,619 | 720,729 |
| Refinery products: | | | | |
| Gasoline | do | 6,698 | 3,796 | 4,412 |
| Jet fuel | do | 6,112 | 4,599 | 1,175 |
| Kerosine | do | | | 4,118 |
| Distillate fuel oil | do | 10,468 | 11,060 | 7,973 |
| Residual fuel oil | do | 5,270 | 5,183 | 5,278 |
| Lubricants | do | NA | NA | 353 |
| Other | do | 5,197 | 4,220 | 9,256 |
| Refinery fuel and losses | do | 1,318 | 1,109 | 2,017 |
| Total | do | 35,063 | 29,967 | 34,582 |
| Salt [e] | thousand metric tons | 55 | [r] 60 | 60 |
| Sulfur, elemental: | | | | |
| Native frasch | do | 137 | 395 | [e] 710 |
| Byproduct [e] | do | 110 | 140 | 140 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to the commodities listed, juss (an impure sandy gypsum), lime, and a variety of crude construction materials (clays, stone, sand, and gravel) are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

## TRADE

Iraq and Italy negotiated important trade agreements in 1974. Italian firms will assist Iraq in numerous projects including the construction of an electric powerplant, a petrochemical complex, and a steel mill, and Iraq will export large quantities of petroleum to Italy. Iraq resumed diplomatic relations with West Germany, which were broken off in 1965, and reestablished diplomatic relations with the United Kingdom, which were broken off in 1971.

In 1974, Iraq negotiated a trade agreement with Japan to supply 670 million barrels of crude oil and approximately 525 million barrels of refined petroleum products to Japan over a 10-year period. Japan agreed to loan Iraq about $1 billion to be used in various development projects.[4] Spain signed agreements with Iraq for supplies of crude oil totaling 186 million barrels between 1974 and 1979, and Spain agreed to install some 30 agricultural, engineering, and industrial projects in Iraq.

Iraq also signed a protocol with Syria for the establishment of a free trade zone on the Mediterranean coast. Yugoslavia will participate in development projects in Iraq valued up to $3 billion under an economic agreement signed during the year.

INOC's crude oil export pipeline (formerly owned by the Iraq Petroleum Co.) to Mediterranean tanker terminals and refineries in Lebanon and Syria operated at reduced rates in 1974, brought about by reduced demand by European consumers and by competition from lower priced oils available on the Persian Gulf. Crude oil pumped to Bāniyās totaled 183.4 million barrels averaging 502,568 barrels per day (off 18,525 barrels per day from 1973). Crude oil pumped to Tripoli totaled 123.0 million barrels averaging 336,873 barrels per day (down 130,556 barrels per day from 1973).

[3] Middle East Economic Survey (Beirut, Lebanon). Iraq Boosts 1980 Production Target to 6 Million b/d. V. 17, No. 30, May 17, 1974, p. 7.
[4] Middle East Economic Survey (Beirut, Lebanon). Japan Grants Iraq $1,000 Million Loan to be Repaid in Oil. V. 17, No. 13, January 18, 1974, p. 3.

## Table 2.—Iraq: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum metal, waste and scrap | 450 | 87 |
| Copper metal, waste and scrap | 120 | -- |
| Iron and steel: | | |
| Scrap | r 1,672 | 250 |
| Primary metal and semimanufactures | 15 | -- |
| Lead metal: | | |
| Scrap | 100 | 450 |
| Unwrought and semimanufactures | 198 | 836 |
| Manganese oxides | 50 | -- |
| Nickel alloys, unwrought | 4 | -- |
| Tin metal, scrap | 100 | -- |
| Zinc metal, scrap | 1,080 | 2,311 |
| **NONMETALS** | | |
| Asbestos | 216 | 207 |
| Cement | 369,901 | 506,187 |
| Chalk | 31 | 11 |
| Clay products, nonrefractory | 887 | 998 |
| Fertilizer materials: | | |
| Crude | 100 | 2,100 |
| Manufactured, nitrogenous | 72,115 | 25,645 |
| Ammonia | 5 | 16 |
| Gypsum and plasters | 1,075 | 5,000 |
| Lime | 3,200 | 2,100 |
| Stone, sand and gravel: | | |
| Dimension stone, unworked | 251 | 407 |
| Gravel and crushed stone | 49,869 | 48,324 |
| Sand, excluding metal bearing | (1) | 2,135 |
| Sulfur, sulfuric acid | -- | 19 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Asphalt and bitumen, natural | 13,658 | 47,446 |
| Petroleum: | | |
| Crude and partly refined ---- thousand 42-gallon barrels | 525,613 | 704,610 |
| Refinery products: | | |
| Gasoline ---- do ---- | r 245 | 315 |
| Kerosine ---- do ---- | -- | 258 |
| Distillate fuel oil ---- do ---- | 255 | 780 |
| Residual fuel oil ---- do ---- | 36 | 29 |
| Lubricants ---- do ---- | 44 | 22 |
| Other: | | |
| Liquefied petroleum gas ---- do ---- | -- | 6 |
| Mineral jelly and wax ---- do ---- | 8 | 21 |
| Total ---- do ---- | r 588 | 1,431 |

r Revised.
1 Less than ½ unit.

## Table 3.—Iraq: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum: | | |
| Oxide | -- | 51 |
| Metal, semimanufactures | 4,176 | 3,779 |
| Chromium oxide and hydroxide | 2 | -- |
| Copper, unwrought and semimanufactures | 3,701 | 1,897 |
| Iron and steel: | | |
| Ore and concentrate, except roasted pyrite | 164 | -- |
| Pig iron, including cast iron | 348 | 1,028 |
| Sponge iron, powder, shot | 11,515 | 10,294 |
| Ferroalloys | (1) | 3 |
| Steel, primary forms: | | |
| Ingots | 179 | 1,524 |
| Blooms, billets, slabs, sheets, bars | 8 | -- |
| Coils for rerolling | 2,231 | -- |
| Tube and pipe blanks | 31,289 | 60,111 |
| Semimanufactures | r 326 | 390 |
| Lead: thousand tons | | |
| Oxide | 3 | 50 |
| Metal including alloys, all forms | 1,415 | 563 |
| Magnesium and beryllium | 62 | 536 |
| Mercury ---- 76-pound flasks | 3 | 77 |
| Nickel metal including alloys, all forms | 2 | 16 |
| Platinum-group metals and silver ---- troy ounces | 1,833 | 1,318 |
| Rare earth metals including alloys, all forms | (1) | -- |

See footnote at end of table.

## Table 3.—Iraq: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS—Continued** | | |
| Tin: | | |
| Oxide ---- long tons | -- | 3 |
| Metal including alloys, all forms ---- do | 106 | 120 |
| Titanium oxides | 552 | 790 |
| Zinc: | | |
| Oxide and peroxide | 26 | 201 |
| Metal including alloys, all forms | 533 | 863 |
| Other: | | |
| Ores and concentrates of base metals, n.e.s | 10 | 40 |
| Ash and residues containing nonferrous metals | 15 | 54 |
| Oxides hydroxides, and peroxides of metals, n.e.s | 148 | 36 |
| Metals including alloys all forms: | | |
| Metalloids | r 651 | 2 |
| Pyrophoric alloys | 6 | 2 |
| **NONMETALS** | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | 1 | (1) |
| Grinding and polishing wheels and stones | 198 | 198 |
| Asbestos | 4,138 | 1,556 |
| Barite and witherite | 687 | 10,427 |
| Boric oxide and acid | 6 | 100 |
| Cement, hydraulic | 62,281 | 127,112 |
| Chalk | 190 | 52 |
| Clay and clay products: | | |
| Crude clay | 1,883 | 10,575 |
| Products: | | |
| Refractory (including nonclay bricks) | 4,054 | 7,034 |
| Nonrefractory | 2,773 | 4,266 |
| Diamond, gem, not set or strung ---- thousand carats | 45 | 95 |
| Fertilizer materials: | | |
| Crude, natural | (1) | (1) |
| Manufactured: | | |
| Nitrogenous | 29,533 | 10,007 |
| Phosphatic | 17,000 | 15,051 |
| Potassic | 1,700 | 4 |
| Ammonia | 24 | 50 |
| Graphite, natural | 27 | (1) |
| Lime | 220 | 3 |
| Mica, all forms | 13 | 20 |
| Pigments, mineral: | | |
| Natural, crude | 2,007 | 932 |
| Iron oxides, processed | 648 | 282 |
| Salt | 51 | 500 |
| Sodium and potassium compounds, n.e.s.: | | |
| Caustic soda | 10,937 | 9,082 |
| Caustic potash | 2 | 2 |
| Stone, sand and gravel: | | |
| Dimension stone, crude and partly worked | 302 | 102 |
| Gravel and crushed stone | 2 | 2 |
| Limestone (except dimension) | 333 | 310 |
| Quartz and quartzite | 18 | -- |
| Sand, excluding metal bearing | 108 | 30 |
| Sulfur: | | |
| Elemental: | | |
| Other than colloidal | 14 | 25 |
| Colloidal | 1,845 | -- |
| Sulfuric acid | (1) | -- |
| Talc, steatite, soapstone, and pyrophyllite | 481 | 476 |
| Other nonmetals, n.e.s.: | | |
| Oxides and hydroxides of magnesium, strontium, barium | 1 | 2 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Asphalt and bitumen, natural | 26 | 323 |
| Carbon black | 74 | 122 |
| Coal and coke, including briquets | 1,230 | 608 |
| Hydrogen, nitrogen and rare gases | -- | 10 |
| Petroleum refinery products: | | |
| Gasoline ---- thousand 42-gallon barrels | 2 | 5 |
| Kerosine ---- do | -- | 204 |
| Distillate fuel oil ---- do | 536 | 504 |
| Residual fuel oil ---- do | (1) | -- |
| Lubricants ---- do | 2 | 3 |
| Other: | | |
| Liquefied petroleum gas ---- do | 27 | (1) |
| Mineral jelly and wax ---- do | (1) | (1) |
| Nonlubricating oils, n.e.s ---- do | (1) | (1) |
| Pitch ---- do | 3 | (1) |
| Bituminous mixtures, n.e.s ---- do | 14 | 11 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 2,454 | -- |

r Revised.
1 Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Iraq issued a $130 million contract to a French firm for the construction of an aluminum smelter rated at 30,000 tons per year at An Nasiriyah, 340 kilometers south of Baghdad. The plant is expected to begin production in 1977.

**Iron and Steel.**—Société Générale de Sidérurgie was formed to manage Iraq's iron and steel industry, and Creusot-Loire Entreprises of France began construction of the iron and steel manufacturing complex at Khor al-Zubair, near Umm Qasr in southern Iraq. In 1974, Iraq awarded a $120 million contract to the same firm to build a sponge iron plant at Khor al-Zubair with an annual output capacity of 1.2 million tons of sponge iron. Both plants were scheduled for completion in 1977.

### NONMETALS

**Cement.**—Construction activities continued on cement plants at Al Fallujah, Al Kufah, and Umm Qasr. The Al Fallujah project was expected to begin production in August 1975 at an initial yearly rate of 240,000 tons of cement, the Al Kufah plant was scheduled to start cement production in October 1974 at the yearly rate of 200,000 tons, and during 1974 the Umm Qasr plant began output of cement at the initial rate of 255,000 tons per year.

Contracts were issued during the year to foreign firms for the construction of three additional cement plants. A firm from the U.S.S.R. will build a 500,000-ton-per-year plant valued at $40.5 million at Al-Samawah in southern Iraq, and a French firm will build a cement plant of the same capacity at Hammam al 'Alil in the north.[5] A Danish company received a contract valued at $255 million to build a 2-million-ton-per-year plant near Al Kufah.[6]

**Lime.**—A project was under way in mid-year to double the size of the small Hammam al 'Alil lime plant. It will cost about $1 million and will raise the plant's capacity to 60,000 tons of lime per year.

**Sulfur.**—INMC awarded a contract to Chemical Construction (GB) Ltd. for the engineering and construction of a 50-ton-per-day sulfuric acid plant at Mishraq in north Iraq.[7]

### MINERAL FUELS

**Natural Gas.**—Iraq developed plans to establish industries which would utilize large quantities of natural gas. The Ministry of Industry and Minerals invited international firms to submit bids for contracts to build a petrochemical complex at Az Zubayr in southern Iraq which will utilize about 120 million cubic feet per day of natural gas to produce about 120,000 tons per year of plastic ethylene derivatives. INOC also invited international bids for the construction of a large natural gas liquids plant to produce liquefied petroleum gas (LPG) from natural gas at the rate of approximately 3.8 million tons per year. The LPG plant is one of a number of industrial projects to be financed by the $1 billion loan from Japan.

**Petroleum.**—In 1974, oil exploration surveys were conducted mainly by the INOC, but several firms also carried out surveys in the country. An East German company signed a contract to carry out a seismic survey in central Iraq near An Narjaf and Karbala, and Indian teams conducted seismic surveys in southern Iraq. The Romanian company, Geomin, carried out seismic surveys in central Iraq, Machinoexport of the Soviet Union signed a $3.4 million contract for further seismic work northeast of Baghdad, and drilling in northern Iraq by Technoexport Stroy of Bulgaria resulted in an oil discovery near the Syrian border. In June, INOC discontinued negotiations with about 40 oil companies for service contracts to develop large blocks of land that had been advertised in July 1973. INOC signed a contract with the U.S.S.R. for the preparation of the third development stage of the North Rumaila oilfield, which will raise the field's annual output capacity to 313 million barrels from about 45 million barrels.

INOC increased its drilling activities in 1974 when 105,184 meters were drilled (development wells 89,776 meters, evaluation wells 7,242 meters, and exploration

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[5] Middle East Economic Survey (Beirut, Lebanon). Iraq Signs Contracts for Establishment of Two Cement Plants. V. 17, No. 45, Aug. 30, 1974, p. 7.

[6] Middle East Money. Danes Win $255 Million Cement Factory Contract. V. 1, No. 22, Nov. 23, 1974, p. 4.

[7] Sulphur. Iraq. No. 107, July-August 1974, p. 19.

wells 8,166 meters), nearly double the 53,855 meters drilled in 1973. Elf-Iraq, a subsidiary of the French company Essence et Lubrifiant de France—Entreprise de Récherches et d'Activités Pétrolières, discovered oil southeast of the Abu Ghurāb oilfield, and INOC reported two oil discoveries, one west of Ain Zalah oilfield and one east of Baghdad.

A Czechoslovakian firm completed construction of the 70,000-barrel-per-day petroleum refinery near Al Basrah, and the INOC placed it on-stream in 1974. The Iraquis then approved a project to double the throughput capacity of the new plant. An agreement was reached between Iraq and Somalia for the establishment of a jointly-owned petroleum refinery in Somalia. The small 10,000-barrel-per-day plant will process Iraqi crude oil. Iraq agreed to train the Somalian refinery staff and to assist them in marketing the plant's output.

Iraq was concerned with four pipeline projects in 1974. Construction of the Kirkuk to Dörtyol, Turkey, crude oil pipeline was delayed [8] and rescheduled for early 1975. The total length of the international pipeline was reset at 981 kilometers (640 kilometers in Turkey and the remainder in Iraq) from the previously estimated length of 1,005 kilometers.[9] The U.S.S.R. signed a $37 million contract with Iraq for the construction of a 600-kilometer, 20-centimeter petroleum refined products pipeline to connect Iraq's Baghdad and Al Basrah refineries.[10] Scheduled for completion in 1976, the line will have a throughput capacity of 30,000 barrels per day of petroleum products. In 1974, Iraq began construction of parallel pipelines between Al Hadithah and Rumaila. Each line will be 665 kilometers long. One line will be used to transport crude oil between the two points, and the other line will transport natural gas.

In an effort to significantly enlarge its fleet of oil tankers, the Iraq Oil Tankers Co. (IOTC) placed orders with foreign shipyards for the construction of nine ships with an aggregate tonnage of nearly 1.3 million deadweight tons. Four 154,000 deadweight-ton tankers were ordered from a Swedish shipyard, with deliveries scheduled for 1976 and 1977; and five oil tankers (one 144,000 deadweight ton and four 125,000 deadweight-ton tankers) were ordered from two Japanese shipyards, with deliveries scheduled during the next 3 years. The board of directors of the INOC approved the participation of the IOTC in the Organization of Arab Petroleum Exporting Countries' project, Arab Company for Shipbuilding and Repair, to construct a dry dock in Bahrain to service tankers engaged in international oil trade. The project was also backed by Bahrain, Kuwait, Libya, and Saudi Arabia; Iraq's investment amounted to $12.7 million.

[8] Journal of Commerce. Turkish-Iraq Pipeline Delayed. V. 320, No. 23,176, Apr. 12, 1974, p. 8.
[9] Middle East Economic Survey (Beirut, Lebanon). Mannesmann Awarded Contracts for Iraq-Turkey Pipeline Project. V. 18, No. 6, Nov. 29, 1974, p. 4.
[10] Middle East Economic Survey (Beirut, Lebanon). Japanese Firms Awarded Contract for the Supply of Pipe for the Baghdad-Basrah Products Pipeline. V. 18, No. 9, Dec. 20, 1974, p. 7.

# The Mineral Industry of Ireland

By J. M. West [1]

Throughout 1974 the problems of high inflation rates and unemployment continued to affect the Irish mineral industry and the general Irish economy. The gross national product (GNP) declined slightly, while consumer prices increased 20%. High costs of raw materials and fuel contributed to poor economic performance. The rate of investment in industry increased only 0.5% in real terms. Unemployment was expected to continue at about 9% in 1975, and the economic forecast was for continued generally depressed conditions but with substantial wage increases for industrial workers resulting from a new National Wage Agreement in the first half of 1975.

Offshore petroleum exploration was considered a promising area of economic activity, and in 1975 the Government was expected to announce terms for licensing offshore oil development. A $12 million service base for offshore drilling equipment was planned in the Aghada area of Cork's lower harbor. Planning was also in progress for a government-sponsored $72 million ammonia and urea plant at Marina Point in the River Lee estuary, Cork. The Energy Supply Board continued plans for a nuclear reactor generating plant in the Wexford area and prepared plans for a $164 million gas-fired generating plant in County Cork, which would utilize natural gas discovered 30 miles offshore.

Negotiations continued between the Irish Government and Tara Mines Ltd., a subsidiary of the Canadian-based Tara Exploration and Development Co. Ltd., over terms and extent of state control of the Navan zinc-lead mine development. The deposits were believed to be the largest in Europe, and a large sum had already been spent by Tara on preparation for mining under the assumption that a mining license would be issued without dispute. Negotiations were deadlocked at yearend, and delays until late 1975 or mid-1976 were expected in reaching production.

## PRODUCTION

Production of copper concentrates and mercury decreased during 1974, and outputs of lead and zinc concentrates were reduced by declining grades and mill throughputs. Cement production increased despite fuel limitations for cementmaking. Production of refined petroleum products was higher than in 1973. A significant increase occurred in fertilizer production utilizing imported phosphates and sulfur. Less iron and steel were produced in 1974.

[1] Physical scientist, Division of Nonferrous Metals.

## Table 1.—Ireland: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| **METALS** | | | | |
| Copper, mine output, metal content | | [r] 13,655 | 13,000 | 12,700 |
| Lead, mine output, metal content | | [r] 59,620 | 56,200 | 37,700 |
| Iron and steel, crude steel | thousand tons | 77 | 116 | 112 |
| Mercury | 76-pound flasks | [r] 1,234 | 1,345 | 775 |
| Silver, mine output, metal content | thousand troy ounces | 1,553 | 1,839 | 1,980 |
| Zinc, mine output, metal content | | [r] 94,919 | 68,888 | 67,000 |
| **NONMETALS** | | | | |
| Barite | | 237,217 | 270,370 | 323,000 |
| Cement, hydraulic | thousand tons | [r] 1,535 | 1,651 | 1,675 |
| Gypsum | do | 386 | 436 | 384 |
| Lime | do | [r e] 65 | 76 | [e] 76 |
| Sand and gravel [2] | do | NA | 6,078 | NA |
| Stone, limestone [2] | do | NA | 8,932 | NA |
| Other [3] | do | NA | 4,248 | NA |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | |
| Coal, anthracite and bituminous | do | 75 | 64 | 68 |
| Coke, gashouse including breeze | do | 27 | 37 | [e] 37 |
| Peat: | | | | |
| Agricultural use | do | [e] 60 | 77 | [e] 80 |
| Fuel use: | | | | |
| Briquet | do | [e] 330 | 326 | NA |
| Sod peat [4] | do | [e] 2,200 | 1,986 | NA |
| Milled peat [5] | do | [e] 3,000 | 1,864 | NA |
| Petroleum refinery products: | | | | |
| Gasoline | thousand 42-gallon barrels | 4,046 | 3,904 | 4,080 |
| Jet fuel | do | 608 | 626 | [e] 625 |
| Distillate fuel oil | do | 4,968 | 5,177 | 5,505 |
| Residual fuel oil | do | 8,671 | 8,343 | 8,425 |
| Other | do | 960 | 1,013 | NA |
| Refinery fuel and losses | do | 777 | [e] 769 | NA |
| Total | do | 20,030 | 19,832 | NA |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, substantial quantities of stone, sand, and gravel are produced by local authorities for purposes such as maintenance of roads, but statistics on such output are not reported and available general information is inadequate to make reliable estimates of output levels.

[2] Excludes output by local authorities.

[3] Figures given as reported in source; includes granite, marble, silica rock, sand, calcspar, fire clay, and shale and clays for cement production, but excludes output of these materials by local authorities.

[4] Includes production by farmers and by Bord Na Mona.

[5] Includes milled peat used in the production of peat briquets listed previously in this table.

## TRADE

Values for metal ores and scrap exports increased more than 50% in 1974, owing chiefly to higher prices. Copper concentrate exports declined. Exports of petroleum products declined, but imports of crude and refined petroleum increased significantly. Imports of sulfur increased 45% to 86,000 tons in the first 10 months of 1974. Steel scrap imports declined 48% in the same period, to 216,000 tons. Generally, in 1974 values of crude fertilizer and other nonmetallic mineral imports more than doubled, value of imported fuels about tripled, and value of imported metal ores and scrap increased about 50%.

## Table 2.—Ireland: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys: | | | |
| Scrap | -- | 239 | NA. |
| Unwrought and semimanufactures | 4,593 | 8,870 | Mainly to United Kingdom. |
| Copper: | | | |
| Ore and concentrate, gross weight | 55,887 | 11,142 | Spain 9,914; Netherlands 1,228. |
| Metal including alloys: | | | |
| Scrap | 4,755 | 4,627 | United Kingdom 2,192; West Germany 1,021. |
| Unwrought | 601 | 40,479 | Spain 16,930; Sweden 16,585. |
| Semimanufactures | 1,144 | 1,513 | United Kingdom 1,144. |
| Iron and steel metal: | | | |
| Scrap | 11,694 | 12,684 | Spain 7,149; West Germany 2,003. |
| Semimanufactures | r 78,337 | 83,570 | Mainly to United Kingdom. |
| Lead: | | | |
| Ore and concentrate, gross weight | 123,364 | 126,175 | France 39,034; Belgium-Luxembourg 34,575; West Germany 24,069. |
| Metal including alloys: | | | |
| Scrap | 2,670 | NA | |
| Unwrought and semimanufactures | 1,928 | 5,061 | Mainly to United Kingdom. |
| Zinc ore and concentrate | 164,436 | 150,006 | France 47,214; Netherlands 30,919; Poland 14,760. |
| Other nonferrous scrap | 1,493 | 1,642 | NA. |
| NONMETALS | | | |
| Asbestos | (1) | 88 | NA. |
| Barite and witherite | 241,066 | NA | NA. |
| Cement | 117,876 | 168,545 | Mainly to United Kingdom. |
| Clay products, refractory (including nonclay bricks) | 28,800 | 63,456 | United Kingdom 30,828; West Germany 20,646. |
| Fertilizer materials: | | | |
| Crude | 22,059 | 5,132 | United Kingdom 5,131. |
| Manufactured | 64,148 | 61,000 | United Kingdom 51,000. |
| Gypsum and plaster | 103,111 | 2 143,352 | NA. |
| Salt | (1) | 49 | NA. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude | 104 | 469 | NA. |
| Worked | 336 | 237 | United Kingdom 213. |
| Gravel and crushed stone | 290,826 | 420,022 | NA. |
| Limestone (except dimension) | 23,828 | (2) | NA. |
| Sand | 171 | 78 | NA. |
| Other nonmetals, n.e.s.: | | | |
| Crude, n.e.s | 1 241,066 | 238,080 | United States 159,068; Nigeria 20,940. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 15,421 | 12,630 | United Kingdom 9,188; Hong Kong 2,820. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | (1) | 38 | NA. |
| Coal and briquets: | | | |
| Anthracite and bituminous coal | r 135,356 | 66,053 | United Kingdom 40,051; Netherlands 14,053. |
| Briquets of anthracite and bituminous coal | r 2,452 | 4,715 | NA. |
| Coke and semicoke | 19,096 | 34,185 | Sweden 20,647; Netherlands 5,811. |
| Peat, including briquet and litter | 106,042 | 123,800 | United Kingdom 120,511. |
| Petroleum refinery products: | | | |
| Gasoline thousand 42-gallon barrels | -- | 47 | Mainly to United Kingdom. |
| Distillate fuel oil do | 380 | 221 | United Kingdom 161; West Germany 60. |
| Residual fuel oil do | 3,111 | 2,970 | All to United Kingdom. |
| Lubricants do | 5 | 34 | Do. |
| Other: | | | |
| Liquefied petroleum gas do | -- | 24 | United Kingdom 23. |
| Unspecified do | 158 | NA | NA. |
| Total do | 3,654 | 3,296 | |

r Revised. NA Not available.

1 Asbestos, natural asphalt and bitumen, and salt included with other crude nonmetals n.e.s.

2 Limestone included with gypsum and plasters.

## Table 3.—Ireland: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys: | | | |
| Unwrought | 3,939 | 6,009 | Canada 2,899; United Kingdom 2,637. |
| Semimanufactures | 6,727 | 8,606 | United Kingdom 6,503; Belgium-Luxembourg 707. |
| Copper metal including alloys: | | | |
| Unwrought | 225 | 317 | United Kingdom 296. |
| Semimanufactures | 11,091 | 12,075 | United Kingdom 10,878; Belgium-Luxembourg 501. |
| Iron and steel metal: | | | |
| Pig iron, including cast iron | 21,924 | 14,984 | U.S.S.R. 13,537; United Kingdom 1,447. |
| Sponge iron, powder and shot | 58 | 847 | United Kingdom 758. |
| Ferromanganese | 1,158 | 1,303 | Netherlands 660. |
| Steel, primary forms | 5,290 | 21,871 | United Kingdom 12,858; West Germany 5,544. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, and sections | 97,903 | 281,615 | United Kingdom 134,190; West Germany 55,406. |
| Universals, plates, and sheets | 121,439 | 287,817 | United Kingdom 112,187; West Germany 59,989. |
| Hoop and strip | 6,797 | 10,657 | United Kingdom 9,509; West Germany 785. |
| Rails and accessories | 4,988 | 16,255 | United Kingdom 14,960. |
| Wire | 14,878 | 20,902 | Netherlands 11,028; United Kingdom 6,335. |
| Tubes, pipes, and fittings | 53,395 | 157,395 | United Kingdom 123,604; Netherlands 8,938. |
| Castings and forgings, rough | 1,865 | 3,453 | United Kingdom 2,370. |
| Total semimanufactures | 301,265 | 778,094 | |
| Lead: | | | |
| Oxides | 2,991 | 2,858 | NA. |
| Metal including alloys, all forms | 2,270 | 5,067 | United Kingdom 4,242. |
| Manganese oxide | 455 | 736 | NA. |
| Nickel metal including alloys, unwrought and semimanufactures | 303 | 1,082 | United Kingdom 468. |
| Platinum-group metals and silver including alloys: | | | |
| Platinum group, value, thousands | $230 | $388 | United Kingdom $377. |
| Silver do | $268 | $615 | United Kingdom $584. |
| Tin metal including alloys, unwrought and semimanufactures, long tons | 68 | 153 | United Kingdom 117. |
| Titanium oxides | 3,404 | 4,160 | NA. |
| Zinc: | | | |
| Oxides | 721 | 1,032 | NA. |
| Metal including alloys: | | | |
| Unwrought | 3,944 | 4,532 | United Kingdom 4,294. |
| Semimanufactures | 1,070 | 822 | United Kingdom 757. |
| Other: | | | |
| Nonferrous ore and concentrate, n.e.s | 4,899 | 32,371 | United States 23,172. |
| Metals nonferrous base metals including alloys all forms, n.e.s. value, thousands | $650 | $301 | United States $51. |
| NONMETALS | | | |
| Abrasives natural: | | | |
| Crude n.e.s do | $303 | $334 | United Kingdom $240. |
| Grinding and polishing wheels and stones | 408 | 624 | United Kingdom 282; West Germany 75. |
| Asbestos | 4,191 | 3,717 | Republic of South Africa 1,687; Canada 1,094. |
| Cement, hydraulic | 268,013 | 23,336 | United Kingdom 12,711; Denmark 7,810. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s | 18,437 | 22,038 | NA. |
| Products: | | | |
| Refractory (including nonclay bricks) | 15,701 | 39,781 | United Kingdom 37,215; Austria 852. |
| Nonrefractory | 9,818 | 9,354 | United Kingdom 6,920; West Germany 844. |

See footnote at end of table.

Table 3.—Ireland: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials: | | | |
| Crude: | | | |
| Phosphatic | 297,170 | 434,189 | Morocco 430,113. |
| Other | NA | 537 | NA. |
| Manufactured: | | | |
| Nitrogenous | 86,671 | 226 | United Kingdom 99; Netherlands 69. |
| Phosphatic: | | | |
| Thomas slag | 174,799 | 128,009 | NA. |
| Other | 23,198 | 205,772 | NA. |
| Potassic | 237,351 | 427 | West Germany 156; France 91. |
| Other, including mixed | 89,662 | 135 | United Kingdom 82; Belgium-Luxembourg 20. |
| Ammonia | 50,810 | 66,150 | NA. |
| Lime | 7,275 | 6,393 | All to United Kingdom. |
| Magnesite | 4,378 | 12,386 | NA. |
| Pigments, mineral iron oxides, processed | 1,224 | 1,429 | NA. |
| Salt | 55,484 | 59,610 | United Kingdom 44,578; West Germany 11,688. |
| Sodium and potassium compounds, n.e.s | 10,752 | 10,453 | NA. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 4,077 | 3,340 | NA. |
| Worked | 232 | 367 | NA. |
| Dolomite, chiefly refractory grade | 1,251 | 144 | NA. |
| Gravel and crushed rock | 92,478 | 143,886 | NA. |
| Limestone (except dimension), including gypsum | NA | 2,310 | NA. |
| Sand, excluding metal bearing | 59,768 | 86,629 | NA. |
| Sulfur: | | | |
| Elemental, other than colloidal | 39,207 | 77,764 | United States 55,403; France 6,438. |
| Sulfuric acid, including oleum | 80,372 | 29,959 | NA. |
| Other: | | | |
| Crude nonmetals, n.e.s | 18,006 | 19,436 | United Kingdom 10,100. |
| Slag, dross, and similar waste, not metal bearing | 6,248 | NA | |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 7,431 | 6,099 | United Kingdom 5,633. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 4,922 | 6,484 | United Kingdom 3,504. |
| Coal and briquets, anthracite and bituminous coal thousand tons | 892 | 807 | Poland 595; United Kingdom 128. |
| Coke and semicoke do | 17 | 53 | Mainly from United Kingdom. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 17,955 | 17,442 | Iran 6,768; Kuwait 4,723. |
| Refinery products: | | | |
| Gasoline do | 2,301 | 4,197 | United Kingdom 3,620. |
| Kerosine do | 2,676 | 2,494 | United Kingdom 2,398. |
| Distillate fuel oil do | 2,733 | 5,194 | United Kingdom 5,093. |
| Residual fuel oil do | 10,603 | 10,703 | United Kingdom 8,591. |
| Lubricants do | 307 | 842 | United Kingdom 689; U.S.S.R. 130. |
| Other: | | | |
| Liquefied petroleum gas do | 534 | 1,086 | United Kingdom 1,070. |
| Mineral jelly and wax do | 27 | 30 | United Kingdom 16; West Germany 6. |
| Nonlubricating oils, n.e.s. do | 606 | 215 | NA. |
| Bitumen and other residues, and bituminous mixtures, n.e.s do | 711 | 56 | NA. |
| Total do | 20,498 | 24,817 | |

NA Not available.

## COMMODITY REVIEW

### METALS

**Copper, Lead, Zinc, Mercury, and Silver.**—Copper, mercury, lead, and zinc production were all lower but silver production was higher than in 1973. According to the 1974 Annual Report of Northgate Exploration Ltd., production at the Tynagh lead-zinc mine was below that forecast because of a shortage of minable ore and lower ore grades. Reserves were expected to be adequate for 6 years of operation but

at lower grades than those in 1974. The company's Gortdrum copper mine continued to operate satisfactorily, but reserves were expected to be exhausted by the second half of 1975. Northgate held a 10% share in Tara Exploration and Development Co., Ltd., which was developing the Navan lead-zinc deposit. Prolonged negotiations were completed in February 1975, and production was scheduled to begin in late 1975 at Navan. The new mine is planned for a mining rate of 2.5 million tons of ore yearly, which will result in output of about 470,000 tons of concentrate per year. At the mine, a 1,120-foot shaft was nearing completion and another shaft was begun. Access will also be through an incline for motorized equipment. Major shareholders in the Navan project, in addition to Northgate, were Cominco Ltd. and Noranda Mines Ltd.

Avoca Mines (Canada) Ltd. increased the copper ore milling rate at its property in County Wicklow. After averaging 2,660 tons per day in the first quarter of 1974, the rate was expected to reach 4,000 tons per day by December. Iron pyrite concentrate was roasted, and the product was exported to the United Kingdom.

## NONMETALS

**Cement.**—Cement Ltd. announced plans to expand capacity at its Platin cement plant to 1 million tons per year with the addition of a 0.6-million-ton-per-year dry process kiln. Its older wet process plant at nearby Drogheda was to be closed when the new capacity is on-stream in 1977.

## MINERAL FUELS

Crude petroleum imports increased an estimated 11% and petroleum product imports declined 8% in 1974. During the first 10 months, 2.26 million tons of crude petroleum valued at $168.8 million[2] was imported for refining. In the same period, 2.62 million tons of products valued at $240.4 million was imported; over half of these imports comprised residual fuel oils. Exports of petroleum products were down an estimated 12% in 1974, and in the first 10 months were valued at $21.8 million. New energy saving measures were put into effect in December, including increased gasoline taxes (up 30%), a 50-mile-per-hour nationwide speed limit, and a possible permanent daylight saving time.

Exports of coke and peat products rose an estimated 23% and 6%, respectively, in 1974, while coal exports declined 66%. Sod and milled peat continued to be produced mainly by Bord Na Mona and were used chiefly for generation of electricity.

During the first 10 months of 1974, 48,857 tons of natural gas valued at $4.2 million was imported. The amount was 66% less than in the comparable period of 1973.

Late in the year a second offshore oil discovery was announced. The discovery in the Marathon Petroleum Ireland Ltd. concession area about 50 miles south of Cork City was approximately 10 miles southeast of a first discovery made early in 1974. The second drill hole produced at a rate of 1,500 barrels per day, compared with 780 barrels per day at the first hole. Further testing was postponed until the spring. On November 4, the Minister for Industry and Commerce announced the general Irish Government policy toward licensing of offshore oil operations. Among the provisions of the policy were the right of state participation as an essential feature of each new offshore petroleum license; the state "interests" will consist of three basic elements—taxation of profits, royalties on petroleom produced and the option of state participation. Irish participation other than the option of state participation will not be a condition for licenses granted to foreign companies.

[2] Where necessary, values have been converted from the Irish pound (£) to U.S. dollars at the rate of £1 = US$2.35.

# The Mineral Industry of Israel

By Michael J. Potter [1]

The economy of Israel continued to go through a period of high uncertainty, as the Government attempted to restrain the continuing boom without causing a recession. In 1974, Israel's gross national product (GNP) increased by 7% in real terms despite increasingly restrictive government policies.

The Government announced a series of austerity measures in late 1974 designed to deter inflationary pressures and safeguard foreign exchange reserves. On November 10, 1974, the Israeli pound (I£) was devalued from I£4.2 to I£6.00 per U.S. dollar (the last previous devaluation was in August 1971).[2]

Israel is not rich in mineral resources and its mining industry is modest in comparison with other industrial sectors. Nevertheless, Israel's mining industry plays an important role in the fast-growing chemical industry. In 1974, mineral production was influenced by sharp fluctuations in world demand for minerals. While mineral exports grew faster than total industrial exports, mineral output decelerated. Extraction of phosphate, potash, and bromine was very profitable; however, copper production resulted in serious financial losses because of the collapse in world copper prices.[3]

## PRODUCTION

According to the available information, elemental bromine, flint clay, crude and beneficiated phosphate rock, gypsum, lime, hydraulic cement, marine salt, and glass sand increased in tonnage output compared with 1973. Decreases were noted in kaolin, copper and nitrogenous fertilizers. The Government of Israel considers much of the data on the petroleum industry as classified.[4]

[1] Physical scientist, Division of Nonmetallic Minerals.
[2] U.S. Embassy, Tel Aviv, Israel. State Department Airgram A–54, Mar. 21, 1975, p. 3.
[3] U.S. Embassy, Tel Aviv, Israel. State Department Airgram A–182, Oct. 15, 1975, pp. 1–2.
[4] U.S. Embassy, Tel Aviv, Israel. State Department Airgram A–116, Apr. 21, 1975, pp. 1–3.

## Table 1.—Israel: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Copper, cement 70%–80% Cu: | | | |
| Gross weight | 14,900 | 13,252 | [e] 12,500 |
| Metal content | 11,175 | 10,162 | 9,322 |
| Iron and steel: | | | |
| Pig iron [e] | 40,000 | 40,000 | 40,000 |
| Crude steel [e] | [r] 90,000 | [r] 110,000 | 120,000 |
| **NONMETALS** | | | |
| Bromine: | | | |
| Elemental | [r] 14,000 | 13,040 | 18,000 |
| Compounds | 10,000 | 9,500 | 10,000 |
| Cement, hydraulic thousand tons | 1,545 | 1,258 | 1,428 |
| Clays: | | | |
| Flint clay | 61,000 | 15,000 | 44,000 |
| Metabentonite | 2,000 | 4,000 | 3,800 |
| Kaolin | 29,000 | [e] 29,000 | 4,200 |
| Other | 10,450 | 2,000 | 1,200 |
| Fertilizer materials: | | | |
| Crude: | | | |
| Phosphatic: | | | |
| Unprocessed thousand tons | 1,643 | 1,537 | 2,442 |
| Beneficiated do | 937 | 781 | 1,124 |
| Potassic: | | | |
| Gross weight do | 920 | 878 | 921 |
| $K_2O$ equivalent do | 561 | 535 | 562 |
| Manufactured: | | | |
| Nitrogenous | 108,101 | 138,101 | 122,022 |
| Phosphatic (superphosphate) | 196,000 | 198,900 | 220,100 |
| Potassic | 3,704 | 3,045 | 5,494 |
| Gypsum | 120,000 | 150,000 | 200,000 |
| Lime | 180,000 | [e] 180,000 | 200,000 |
| Salt, marketed (mainly marine) | 61,803 | 61,469 | 112,756 |
| Sand and gravel: | | | |
| Sand: | | | |
| Glass sand | 73,000 | 69,500 | 83,500 |
| Other (for building industry) thousand cubic meters | 5,000 | 3,000 | 3,500 |
| Gravel do | 1,000 | NA | 500 |
| Stone: | | | |
| Dimension, marble | 16,000 | 16,000 | 16,000 |
| Crushed thousand cubic meters | 10,000 | 11,000 | 14,000 |
| Sulfur, elemental [e] | 10,000 | 10,000 | 10,000 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Gas, natural, marketed million cubic feet | 4,386 | 1,907 | 2,327 |
| Peat [e] thousand tons | 20 | 20 | 20 |
| Petroleum: | | | |
| Crude: | | | |
| From Israel proper thousand 42-gallon barrels | 342 | 275 | 281 |
| From occupied Sinai [e] do | 43,578 | 31,918 | 36,219 |
| Refinery products: [e] | | | |
| Gasoline do | 6,307 | 8,246 | 8,644 |
| Jet fuel do | 2,703 | 3,608 | 4,536 |
| Kerosine do | 2,253 | 2,577 | 2,099 |
| Distillate fuel oil do | 9,011 | 9,277 | 10,111 |
| Residual fuel oil do | 19,823 | 21,646 | 21,998 |
| Lubricants do | -- | 155 | 167 |
| Other do | 3,153 | 4,483 | 4,251 |
| Refinery fuel and losses do | 1,803 | 1,546 | 1,877 |
| Total do | 45,053 | 51,538 | 53,683 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, Israel reportedly has the capacity to produce 71 metric tons of $U_3O_8$ per year, but official data are not reported and available information is inadequate to make reliable estimates of output levels.

## TRADE

The balance of payments, Israel's basic economic problem, ran a deficit of almost $800 million in 1974. The current account deficit on goods and services reached $3.4 billion, a 31% increase over 1973. The major causes of these developments were operating the Israeli economy on a quasi-war footing since October 1973 and the expenditure of $1.7 billion for defense imports, both direct and indirect, in 1974. Other contributing factors were the increases in international prices for petroleum, food, and raw materials.[5]

Exports and imports of mineral commodities for the years 1972 and 1973 are shown in tables 2 and 3. Detailed trade data for 1974 were not available. It should be noted that the totals provided for 1973 on the two tables may be incomplete. Because of the October 1973 war, mineral production was affected substantially. Exports of copper cement, crude phosphate rock, and crude and partly refined petroleum decreased 29%, 40% and 31%, respectively compared with 1973. Some exports which showed gains were polished diamonds, 6%, and manufactured phosphates, 37%. Precious and semiprecious stones (except diamond) increased 26% in value. Imports of many mineral commodities were down in 1973 compared with 1972.

[5] Page 3 of work cited in footnote 2.

**Table 2.—Israel: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 [1] | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, all forms | 3,069 | 2,367 | West Germany 44; Belgium 247; Netherlands 208. |
| Copper: | | | |
| Copper cement | 16,384 | 11,621 | United Kingdom 4,653; Spain 3,512; Taiwan 1,899. |
| Matte | 929 | 2,070 | Spain 909; West Germany 486; Republic of Korea 255. |
| Copper sulfate | 12 | -- | |
| Metal, including alloys: | | | |
| Scrap | 1,533 | 454 | Spain 343; Switzerland 48; Belgium 40. |
| Unwrought and semimanufactures | 2,306 | (2) | NA. |
| Gold metal, unworked or partly worked value | $1,000 | -- | |
| Iron and steel metal: | | | |
| Scrap | 481 | 277 | Netherlands 177; West Germany 72. |
| Semimanufactures: | | | |
| Tubes, pipes, and fittings | 12,602 | 10,237 | Romania 7,343; United States 1,161. |
| Castings and forgings, rough value | $61,000 | $92,000 | United States $60,000; West Germany $12,000. |
| Other | 25 | 67 | Cyprus 30; Iran 27; Greece 10. |
| Lead metal including alloys, all forms | 777 | 147 | Netherlands 70; Belgium 35; United Kingdom 21. |
| Nickel metal including alloys, all forms | 98 | 9 | All to United Kingdom. |
| Platinum metal, unwrought or partly worked value | $17,000 | -- | |
| Silver metal, unwrought or partly worked do | $2,000 | $5,000 | All to West Germany. |
| Tin metal including alloys, all forms do | $4,000 | $1,000 | NA. |
| Tungsten [3] | 9 | 8 | All to Italy. |
| Zinc: | | | |
| Oxide | 30 | 557 | All to France. |
| Metal including alloys, all forms | 157 | (4) | NA. |
| Other: | | | |
| Ash and residue containing nonferrous metals | 606 | 386 | Netherlands 121; Sweden 101; West Germany 90. |
| Metals including alloys, all forms: | | | |
| Alkali, alkaline earth, rare-earth metals value | -- | $13,000 | All to Netherlands. |
| Base metals including alloys, all forms, n.e.s | -- | 5 | All to United Kingdom. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s., grinding and polishing wheels and stones value | $26,000 | $58,000 | Turkey $38,000; Canada $11,000; United States $6,000. |
| Barite and witherite | 304 | 225 | Republic of South Africa 214. |

See footnotes at end of table.

## Table 2.—Israel: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 [1] | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Bromine [5] | 917 | 1,290 | United States 386; Argentina 235; Switzerland 88. |
| Chalk | -- | 13 | All to Cyprus. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s | 7,550 | 2,113 | Greece 982; Taiwan 565; Austria 563. |
| Products: | | | |
| Refractory (including nonclay bricks) | 1,185 | 2,283 | West Germany 1,168; Greece 707; Iran 269. |
| Nonrefractory value | $2,000 | $14,000 | Singapore $7,000; United States $3,000; Ivory Coast $2,000. |
| Diamond, gem, not set or strung thousand carats | 2,532 | 2,676 | United States 843; Hong Kong 384; Japan 278. |
| Diatomite and other infusorial earth | -- | 2 | All to Republic of South Africa. |
| Fertilizer materials: | | | |
| Crude, phosphatic | 503,162 | 303,442 | Italy 90,060; Belgium 68,322; Romania 66,004. |
| Manufactured: | | | |
| Nitrogenous | 5 | -- | |
| Phosphatic | 177,985 | 243,581 | Yugoslavia 81,184; Austria 41,477; Taiwan 30,994. |
| Potassic value | $164,000 | $136,000 | Thailand $74,000; Cyprus $62,000. |
| Other, including mixed | 799,536 | 774,480 | France 157,349; United Kingdom 93,764; Italy 90,719. |
| Ammonia | 33 | 28 | Switzerland 18; Philippines 10. |
| Gypsum and plasters | 47 | (6) | NA. |
| Lime | -- | 82 | All to Ethiopia. |
| Magnesite | 66 | 1,948 | All to Austria. |
| Pigments, mineral, natural, crude | 4 | -- | |
| Precious and semiprecious stones, except diamond value, thousands | $3,354 | $4,220 | United States $1,139; United Kingdom $879; West Germany $764. |
| Salt (including brine) | 436 | 111 | Singapore 103. |
| Stone, dimension: | | | |
| Crude and partly worked value | -- | $21,000 | West Germany $20,000. |
| Worked | 55 | 7 | All to United States. |
| Sulfur: | | | |
| Elemental, all forms | 24 | 40 | Taiwan 35; Philippines 5. |
| Sulfuric acid | 89 | 92 | Ethiopia 55; Zambia 37. |
| Other nonmetals, n.e.s.: | | | |
| Crude | -- | 174 | All to West Germany. |
| Slag and ash | 103 | 230 | All to Spain. |
| Bromine, chlorine, fluorine and iodine | 6,324 | 5,532 | United Kingdom 1,750; Netherlands 988; West Germany 683. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 15 | 239 | Cyprus 230; Singapore 9. |
| Carbon black | 6,868 | 4,889 | Thailand 2,027; Turkey 1,790; Malaysia 379. |
| Hydrogen, helium and rare gases | 15 | 3 | All to Iran. |
| Petroleum: [e] [7] | | | |
| Crude and partly refined thousand 42-gallon barrels | 38,441 | 26,470 | NA. |
| Refinery products: | | | |
| Gasoline do | 994 | 890 | NA. |
| Kerosine do | 272 | 298 | |
| Jet fuel do | 380 | 410 | |
| Distillate fuel oil do | 1,559 | 1,615 | |
| Residual fuel oil do | 2,134 | 2,222 | |
| Other do | 639 | 780 | |
| Total do | 5,978 | 6,215 | |

[e] Estimate. NA Not available.

[1] Totals provided for 1973 may be incomplete. The figures presented, unless otherwise specified are the sum of listed detail for all countries for which a quantity figure is provided in official Israeli trade returns; additional quantities may have been exported to other countries for which only a value figure is provided. In some cases, where it is clear that the bulk of the quantity exported was shipped to a country for which no quantity figure was provided, the value figure for the total has been provided in a footnote, together with the corresponding value for the quantity reported for 1972.

[2] Quantity not reported; value of 1973 exports—$925,000 compared with $855,000 in 1972.

[3] May include some manufactured articles.

[4] Quantity not reported; value of 1973 exports—$9,900 compared with $36,000 in 1972.

[5] Elemental bromine is included (inseparable) with chlorine, fluorine and iodine, and is reported in this grouping under other nonmetals in this table.

[6] Less than ½ unit.

[7] Source: United States Department of the Interior, Bureau of Mines, International Petroleum Annual, 1972 and 1973, March 1973 and March 1974.

## Table 3.—Israel: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 [1] |
|---|---|---|
| **METALS** | | |
| Aluminum: | | |
| Bauxite and concentrate | 102 | 301 |
| Oxide and hydroxide | 750 | 708 |
| Metal including alloys, all forms | r 16,042 | 10,092 |
| Arsenic: | | |
| Natural sulfides | 4 | -- |
| Trioxide, pentoxide, acids | 11 | -- |
| Chromium oxide, hydroxide, trioxide | 55 | 44 |
| Cobalt oxide and hydroxide | 19 | 20 |
| Copper: | | |
| Matte | 7 | 59 |
| Metal including alloys all forms | 6,667 | 3,741 |
| Gold metal, unworked or partly worked value, thousands | $6,688 | $13,340 |
| Iron and steel metal: | | |
| Scrap | 550 | [2] |
| Pig iron, ferroalloys, similar materials | 16,425 | 9,340 |
| Steel, primary forms | 89,463 | [3] 64,052 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections | 206,672 | 243,970 |
| Universals, plates and sheets | r 215,396 | 228,467 |
| Hoop and strip | 5,222 | 3,287 |
| Rails and accessories | 2,564 | 333 |
| Wire | 8,327 | 13,023 |
| Tubes, pipes, fittings | r 8,146 | [4] 5,128 |
| High carbon and alloy steel shapes, not further described | 2,735 | 2,400 |
| Lead: | | |
| Oxides | 995 | 845 |
| Metal including alloys, all forms [5] | 4,298 | 2,115 |
| Magnesium metal including alloys, all forms | 83 | [6] 130 |
| Manganese oxides | 397 | 279 |
| Mercury 76-pound flasks | 319 | [7] |
| Nickel metal including alloys, all forms | 40 | 67 |
| Platinum-group metals including alloys, all forms troy ounces | 101,596 | 1,672 |
| Rare-earth metals, compounds do | [8] | 193 |
| Silver metal including alloys, all forms do | 331,249 | 239,973 |
| Tin: | | |
| Oxides long tons | 5 | [9] |
| Metal including alloys, all forms do | [10] 23 | [10] 62 |
| Titanium oxides | 2,952 | 1,654 |
| Zinc: | | |
| Oxide | 514 | 369 |
| Metal including alloys all forms | [11] 4,980 | [11] 3,562 |
| Other: | | |
| Ore and concentrate, n.e.s | 285 | 169 |
| Oxides, hydroxides, peroxides of metals, n.e.s | 254 | 82 |
| Metals including all forms: | | |
| Alkali and rare-earth metals value | $10,000 | $8,000 |
| **NONMETALS** | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | 202 | 142 |
| Corundum, artificial | 270 | 95 |
| Grinding and polishing wheels and stones value, thousands | $400 | $486 |
| Asbestos | 9,402 | 5,168 |
| Barite and witherite | 2 | [12] |
| Boron materials, oxide and acid | 220 | 194 |
| Cement | 509,860 | 402,902 |
| Chalk | 354 | 153 |
| Clays and clay products (including all refractory brick): | | |
| Crude clays, andalusite, kyanite, and etc | 25,807 | 12,996 |
| Products: | | |
| Refractory (including nonclay bricks) | 4,020 | 1,551 |
| Nonrefractory value, thousands | $3,265 | $4,699 |
| Cryolite and chiolite | 15 | -- |
| Diamond: | | |
| Gem, not set or strung thousand carats | r 6,744 | 7,238 |
| Worked: | | |
| Industrial do | 320 | 828 |
| Other do | 616 | 655 |
| Diatomite and other infusorial earth | 518 | 571 |
| Feldspar and fluorspar | 3,836 | 1,785 |
| Fertilizer materials: | | |
| Crude, phosphatic | 37 | -- |
| Manufactured: | | |
| Nitrogenous | 56,144 | 39,142 |
| Other, including mixed | 82 | [13] |
| Ammonia | 2,140 | [14] |
| Graphite, natural | 83 | [15] |
| Gypsum and plasters | 106 | 161 |
| Lime | 5,108 | [16] |
| Magnesite | 851 | 1,179 |
| Mica, crude, including splittings and waste | 48 | 25 |
| Pigments, mineral: | | |
| Natural, crude | 38 | [17] |
| Iron oxides, processed | 465 | 183 |

See footnotes at end of table.

## Table 3.—Israel: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 [1] |
|---|---|---|
| NONMETALS—Continued | | |
| Precious and semiprecious stones, except diamond: | | |
| Natural ____ value, thousands | $1,867 | $3,373 |
| Manufactured, including synthetic ____ do | $160 | $359 |
| Salt | 60 | ([18]) |
| Sodium and potassium compounds, n.e.s | 887 | 1,171 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude and partly worked, calcareous | 952 | 1,192 |
| Worked | 306 | 271 |
| Dolomite, chiefly refractory grade | 201 | ([19]) |
| Gravel and crushed rock | 7,141 | 6,140 |
| Quartz and quartzite | 1,070 | 493 |
| Sand, excluding metal bearing | 86 | 30 |
| Sulfur: | | |
| Elemental, all forms | 64,427 | 16,091 |
| Sulfuric acid | 25,253 | 15,694 |
| Talc, steatite, soapstone, pyrophyllite | 2,086 | 657 |
| Other nonmetals, n.e.s.: | | |
| Crude, mineral substances, n.e.s | 584 | 465 |
| Slag and ash, n.e.s | 892 | ([20]) |
| Oxides and hydroxides of magnesium, strontium, barium | 90 | 43 |
| Bromine, iodine, fluorine | r 3 | 5 |
| Building materials of asphalt, asbestos, fiber cement, unfired nonmetals, n.e.s | 39 | 106 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Asphalt and bitumen, natural | [21] 23 | ([22]) |
| Carbon black | 2,403 | 447 |
| Coal, all grades | 4,657 | 3,245 |
| Coke and semicoke | 1,991 | ([23]) |
| Gas, hydrocarbon, manufactured | -- | 8 |
| Peat, including peat briquets and litter | r 130 | 86 |
| Rare gases (argon) | 29 | 24 |
| Petroleum: [e] | | |
| Crude and partly refined ____ thousand 42-gallon barrels | 40,535 | 46,500 |
| Refinery products: | | |
| Gasoline (including natural): | | |
| Aviation ____ do | 36 | 46 |
| Motor ____ do | 492 | 682 |
| Kerosine ____ do | 636 | 670 |
| Jet fuel ____ do | 784 | 834 |
| Distillate fuel oil ____ do | 328 | 442 |
| Residual fuel oil ____ do | 54 | 122 |
| Lubricants ____ do | 294 | 308 |
| Other ____ do | 470 | 560 |
| Total ____ do | 3,094 | 3,654 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 1,045 | 1,234 |

[e] Estimate. r Revised.

[1] Totals provided for 1973 may be incomplete. The figures presented, unless otherwise specified, are the sum of listed detail for all countries for which a quantity figure is provided in official Israeli trade returns; additional quantities may have been imported from countries for which only a value figure is provided. In some cases, where it is clear that the bulk of the quantity imported was shipped from a country for which no quantity figure was provided, the value figure for the total has been provided in a footnote, together with the corresponding value for the quantity reported in 1972.

[2] Quantity not reported. Value of 1973 imports—$16,000 compared with $15,000 in 1972.

[3] Partial figure. Quantity of puddled bars and pilings not available. Value of 1973 imports of these items—$182,000 compared with $556,000 in 1972 when 1,500 tons were imported.

[4] Partial figure. Quantity of couplings for rubber pressure pipes not available. Value of 1973 imports of these items—$66,000 compared with $104,000 in 1972 when 7 tons were imported.

[5] Partial figures. Quantity of lead foil, tubes, blanks and accessories of lead not available. Value of 1973 imports of these items—$18,000 compared with $19,000 in 1972.

[6] Partial figure. Quantity of unwrought magnesium, waste and scrap not available. Value of 1973 imports of these items—$6,000 compared with $19,000 in 1972 when 20 tons were imported.

[7] Quantity not reported. Value of 1973 imports—$219,000 compared with $100,000 in 1972.

[8] Quantity not reported. Value of 1973 imports—$13,000 compared with $12,000 in 1972.

[9] Quantity not reported. Value of 1973 imports—$18,000 compared with $36,000 in 1972.

[10] Partial figures. Quantity of unwrought tin, n.e.s. and wrought bars, and angles not available. Value of 1973 imports of these items—$351,000 compared with $328,000 in 1972.

[11] Partial figures. Quantity of wrought bars, and angles not available. Value of 1973 imports of items—$91,000 compared with $160,000 in 1972.

[12] Quantity not reported. Value of 1973 imports—$34,000 compared with $1,000 in 1972.

[13] Quantity not reported. Value of 1973 imports—$89,000 compared with $326,000 in 1972.

[14] Quantity not reported. Value of 1973 imports—$49,000 compared with $148,000 in 1972.

[15] Quantity not reported. Value of 1973 imports—$12,000 compared with $24,000 in 1972.

[16] Quantity not reported. Value of 1973 imports—$2,000 compared with $158,000 in 1972.

[17] Quantity not reported. Value of 1973 imports—$22,000 compared with $17,000 in 1972.

[18] Quantity not reported. Value of 1973 imports—$33,000 compared with $14,000 in 1972.

[19] Quantity not reported. Value of 1973 imports—$18,000 compared with $21,000 in 1972.

[20] Quantity not reported. Value of 1973 imports—$2,000 compared with $35,000 in 1972.

[21] Partial figure.

[22] Quantity not reported. Value of 1973 imports—$22,000 compared with $157,000 in 1972.

[23] Quantity not reported. Value of 1973 imports—$459,000 compared with $228,000 in 1972.

## COMMODITY REVIEW

### METALS

**Copper.**—Copper cement exports from the Timna Copper Mines Ltd. increased 32% in calendar year 1973, to $14.7 million. The dampening effect of the October 1973 Arab-Israeli war and the post-war, and steeply rising plant operational costs were offset by increases in world copper prices. Production during the fiscal year ending March 31, 1974, declined by 14% to around 10,200 tons. The Timna 2 underground mine is said to have reserves for the next 15 years. Investment plans were being considered for a new surface mine and an installation for the manufacture of copper compounds. In June, 1974, Timna Copper Mines became a subsidiary of Israel Chemicals Ltd.[6]

**Magnesium.**—During the fiscal year ending March 31, 1974, the Dead Sea Periclase Co. Ltd. plant produced 15,000 tons of magnesium oxide and 27,000 tons of hydrochloric acid. All of the magnesium oxide output, valued at $1 million, was exported. The hydrochloric acid byproduct was shipped to the adjacent Arad Chemical Industries Ltd.'s phosphoric acid plant. During the fiscal year ending in 1975, the plant hopes to reach 60% of its design capacity. This would mean a production of 35,000 tons of magnesium oxide, valued at $3.5 million and 65,000 tons of hydrochloric acid. During the fiscal year ending in 1977, it is expected that plant capacity will reach 100%. Looking even farther ahead, and in view of sharp increases in world prices, plans are to more than double the annual capacity. This would mean an increase in output from 55,000 tons, to 120,000 tons in 3-years time.[7]

### NONMETALS

**Asbestos.**—An industrial complex containing four factories is being setup in the Negev town of Dimona at a cost of $15.5 million. Production items of the Tel Aviv Chemical and Asbestos plant will include asbestos brake linings, fibre, and discs.[8]

**Bromine.**—As a result of the October war, there was a decline of 8% in bromine production to 13,000 tons in the fiscal year ending March 31, 1974.[9] However, production for the calendar year 1974 rose to 18,000 tons.[10] Most of the bromine was exported. Plans call for an increase in production capacity to 50,000 tons per year by yearend 1978. Approximately $3.3 million was to have been invested in 1974 in the expansion program. A sister company of Dead Sea Bromine Works Ltd., Bromine Compounds Ltd., manufactures bromine derivatives for agricultural use. Within the next 2 years the plant will be moved, and a new $18-million plant will result in a substantial increase in production capacity.[11]

**Cement.**—Some 350,000 tons of cement was imported in 1974 to supplement domestic requirements. Nesher Cement Co., Ltd., presently the sole cement manufacturer in Israel, operates three plants. Plans are underway to construct a fourth cement plant at Beit Guvrin. Production at the new plant is scheduled for 1980.[12]

**Diamond.**—Overseas sales in 1974 were valued at $562.2 million. This was slightly more than exports in 1973, when volume was the industry's largest to date. Exports to the United States were $138.7 million, compared with $131.7 million in 1973. Net exports to Hong Kong amounted to $85.1 million, an increase of 19% over 1973. Other major importers of polished gem diamonds from Israel included, in descending order: Switzerland, the Netherlands, Belgium, Japan, West Germany, the United Kingdom, France, Canada, Singapore, Australia, and Italy.[13]

**Fertilizer Materials.**—Phosphate production at the two locations, Oron and Little Crater, amounted to 721,000 tons in fiscal year 1973–74 (ending March 31, 1974). This represented a decline of 9% in production, but an increase of 64% in export earnings compared with the previous years. Approximately 80% of the phosphate production, valued at $11.8 million, was exported.

A $7 million investment was to be made in 1974 in the development of the

[6] U.S. Embassy, Tel Aviv, Israel. State Department Airgram A-173, July 12, 1974, pp. 4–5.
[7] Page 6 of work cited in footnote 6.
[8] The Israel Economist. Asbestos Complex in Dimona. V. 30, No. 6–7, June–July 1974, p. 141.
[9] Page 3 of work cited in footnote 6.
[10] Chemical Age. Dead Sea Bromine Looks a Lively Prospect. V. 110, No. 2894/5, Jan. 3–10, 1975, p. 16.
[11] Pages 3–4 of work cited in footnote 6.
[12] Page 6 of work cited in footnote 3.
[13] Israel Industry and Commerce and Export News. Israel's Diamond Industry. V. 26, March 1975, p. 5.

recently discovered phosphate field at Nahal Zin (18 miles from Oron) and in the laying of an Oron-Nahal Zin railway line. Israel's phosphate reserves were estimated at 270 million tons.[14]

Start-up difficulties continued at the Arad Chemical Industries phosphoric acid plant in the Negev. Production was 8,600 tons during fiscal year 1973–74 (ending March 31, 1974), or 5% of planned output.[15]

Potash production at the Dead Sea works in Sodom is to be increased by 50%, to about 1.5 million tons per year, at a cost of $20 million. Plans at Haifa Chemical are to double potassium nitrate output from 100,000 tons per year, currently, to 220,000 tons by 1976. The company also has slated a new 30,000-ton-per-year dicalcium phosphate facility for next year.[16]

## MINERAL FUELS

**Petroleum.**—Drilling for oil was carried out by "Lapidoth" Israel Oil Prospectors, Inc. at Nir-Am, with plans to reach a depth of 2,200 meters. Drilling at Ramallah was discontinued at 4,500 meters because of a shortage of deep drilling equipment. Negotiations continued for drilling in the Dead Sea area, offshore Ashkelon, and in the Negev.

The Israel Oil Institute decided to undertake an experimental project for storing 30,000 tons of oil underground in the central part of the country. If the experiment is successful, storage could be carried out on a large scale at various places.

A long-term loan of $70 million over 10 years was obtained for expanding oil refining capacity. Present refining capacity is 10 million tons; 6.5 million in Haifa and 3.5 million in Ashdod. Plans call for adding another 3.5 million tons in Haifa.[17]

During 1974, the Eilat-Ashkelon pipeline carried 25.5 million tons of crude oil, compared with 23.4 million tons in 1973.[18]

[14] Page 4 of work cited in footnote 6.
[15] Page 5 of work cited in footnote 6.
[16] Chemical and Engineering News. Israel: Chemical Firms Plan Big Expansions. V. 53, No. 1, Jan. 6, 1975, p. 10.
[17] The Israel Economist. Chemicals and Oil. V. 30, No. 12, December 1974, p. 252.
[18] U.S. Joint Publications Research Service (JPRS). Study Finds Use of Eilat Oil Pipeline a Political Question. Translations on Near East and North Africa, No. 1342. JPRS No. 58355, May 7, 1975, p. 53.

# The Mineral Industry of Italy

By Andrew Kuklis [1]

Rising disposable income due to increased wages and transfer payments generated a high level of economic activity in Italy during most of 1974. The nation's gross national product (GNP) increased to $81.2 billion,[2] or 3% above that of 1973. Government programs intended to control inflation and to arrest the mounting deficit in balance of payments resulted in a decline in production and consumption of goods during the fourth quarter.

Italy's trade deficit in 1974 increased dramatically and totaled $10.7 billion compared with $5.6 billion in 1973. The Nation's trade balance is vulnerable to increases in costs of raw materials, especially hydrocarbons, which account for about two-thirds of total imports.

The value of Italy's imports totaled $40.9 billion compared with $28.0 billion in 1973. Exports increased to $30.2 billion in 1974. Most of the increase was due to inflation. Despite rising prices, depreciation of the floating lira kept Italian manufactured products competitive on the world market.

Exports of chemical products, valued at $3.2 billion in 1974 more than doubled those reported for 1973. Higher exports of plastics, synthetic resins, chemical fertilizers, paints, varnishes, and pharmaceutical products accounted for the increase. Despite higher exports, the nation's chemical trade deficit totaled over $400 million for 1974 but was one-half that reported in 1973.

Foreign investments in Italy totaled $54 million in 1974, an increase of about 40% compared with those of 1973. The European Investment Bank granted a $40 million loan to Italy to finance energy projects and expand the petrochemical industry. Ente Nazionale Idrocarburi (ENI) assigned the funds to 3 major projects, namely: Development of the Molossa oilfield and gasfield, $19 million; construction of a 210-mile pipeline in the Calabria, Puglie, and Basilicata Provinces, $11 million; and expansion and modernization of the Gela petrochemical complex, $10 million.

## PRODUCTION

The overall index of production for the mining industry in 1974 showed an increase of 2% compared with 1973 figures. Lower production was reported for all commodities in the mineral fuels sector except carbon black and coke. In metal mining, all metallic minerals declined except cadmium, copper, and iron ore. Higher output was reported for barite, bentonite, feldspar, potassium salts, fluorspar, talc, and rock salt.

Employment in the mining sector rose for the second consecutive year in part due to the expanding controls of the mineral industries by Ente Gestione Aziende Minerarie S.p.A. (EGAM), a government agency.

Performance of the different sectors in the mining industry are shown in the following tabulation:

| Sector | Index 1970 = 100 | |
|---|---|---|
| | 1973 | 1974 |
| Metallic minerals | 83.6 | 85.7 |
| Nonmetallic minerals | 116.9 | 114.6 |
| Solids, liquids and gas fuels | 121.2 | 124.5 |
| Total mining | 100.3 | 102.4 |

[1] Physical scientist, Division of Ferrous Metals.

[2] Where necessary, values have been converted from Italian lira (Lit) to U.S. dollars at a rate of Lit625=U.S.$1.00.

## Table 1.—Italy: Production of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| **METALS** | | | | |
| Aluminum: | | | | |
| Bauxite | | 96,528 | 49,951 | 31,648 |
| Alumina | | 206,328 | 158,333 | 610,046 |
| Metal: | | | | |
| Primary | | 149,459 | 184,179 | 212,225 |
| Secondary | | 164,000 | 192,000 | 209,000 |
| Antimony: | | | | |
| Mine output, metal content | | 1,201 | 1,358 | 1,228 |
| Regulus | | 1,120 | 1,277 | 1,083 |
| Cadmium, smelter output | | 416 | 397 | 478 |
| Copper: | | | | |
| Mine output, metal content | | 1,049 | 858 | 1,073 |
| Metal, secondary only | | r 9,000 | 12,200 | 13,700 |
| Germanium | | 31 | 52 | 56 |
| Iron and steel: | | | | |
| Iron ore and concentrate [1] | thousand tons | 616 | 522 | 659 |
| Pig iron | do | 9,415 | 10,033 | 11,686 |
| Ferroalloys: | | | | |
| Blast furnace | do | 48 | 65 | 75 |
| Electric furnace | do | 171 | 173 | 174 |
| Crude steel | do | 19,815 | 20,995 | 23,803 |
| Steel, semimanufactures: | | | | |
| Hot rolled: | | | | |
| Wire rod | do | 1,030 | 1,168 | 1,334 |
| Sections | do | 5,596 | 6,457 | 7,028 |
| Plates and sheets | do | 6,613 | 7,521 | 8,323 |
| Hoop and strip | do | 1,041 | 1,051 | 1,154 |
| Railway track material | do | 185 | 173 | 137 |
| Ingots, semimanufacturing and solid for tubes | do | 1,129 | 1,075 | 1,076 |
| Other | do | 861 | 911 | 821 |
| Total hot-rolled | do | 16,455 | 18,356 | 19,873 |
| Casting and forgings | do | 281 | 293 | 417 |
| Cold-rolled sheet | do | r 3,740 | 3,910 | 3,986 |
| Seamless tubes | do | 881 | 836 | 900 |
| Lead: | | | | |
| Mine output, metal content | | 33,700 | 25,900 | 22,354 |
| Metal: | | | | |
| Primary | | 50,138 | 35,127 | 43,465 |
| Secondary | | 19,100 | 11,600 | 68,300 |
| Magnesium metal, primary | | 9,054 | 8,936 | 7,431 |
| Manganese: | | | | |
| Mine output, gross weight | | 25,637 | 25,529 | 14,008 |
| Mine output, metal content | | 7,100 | 6,893 | 3,782 |
| Mercury metal | 76-pound flasks | r 41,801 | 32,692 | 25,933 |
| Silicon, elemental | | 21,250 | 21,070 | 16,190 |
| Silver metal | thousand troy ounces | r 2,170 | 1,349 | 1,318 |
| Zinc: | | | | |
| Mine output, metal content | | 102,600 | 78,600 | 76,160 |
| Metal, primary | | 155,861 | 182,011 | 196,439 |
| **NONMETALS** | | | | |
| Asbestos | | 131,272 | 150,256 | 148,099 |
| Barite | | 181,768 | 167,759 | 179,799 |
| Cement, hydraulic | thousand tons | 33,461 | 36,312 | 36,309 |
| Clays, crude: | | | | |
| Bentonite | do | 275 | 310 | 345 |
| Refractory (excluding kaolinitic earth) | do | 269 | 292 | 353 |
| For cement | do | 5,299 | NA | NA |
| For brick and terra cotta | do | 23,909 | NA | NA |
| Fuller's earth | do | 75 | 114 | 105 |
| Kaolin | do | r 71 | 72 | 90 |
| Kaolinitic earth | do | 16 | 22 | 23 |
| Diatomite | | 35,000 | r e 35,000 | e 35,000 |
| Feldspar | | 182,817 | 189,322 | 237,818 |
| Fertilizer materials: | | | | |
| Crude potassium salts, natural | thousand tons | 1,801 | 1,792 | 2,044 |
| Manufactured, gross weight: | | | | |
| Nitrogenous | do | 2,947 | 3,176 | 3,176 |
| Phosphatic | do | 1,219 | 1,132 | 1,138 |
| Potassic | do | 281 | 258 | 291 |
| Mixed and unspecified | do | 1,633 | 1,672 | 1,750 |
| Fluorspar, all grades | | 276,913 | 235,086 | 249,376 |
| Graphite, all grades | | 773 | 4,161 | 2,530 |
| Gypsum (except dimension stone use) | thousand tons | 3,551 | e 3,500 | e 3,500 |
| Lime (quicklime and hydrated) | do | 2,004 | 2,248 | 2,304 |
| Pigments, natural, crude | | 1,150 | NA | NA |
| Pumice and related materials: | | | | |
| Pumice and pumaceous lapilli | thousand tons | 973 | r e 1,000 | e 1,000 |
| Pozzolan | do | 4,138 | r e 4,200 | e 4,200 |

See footnotes at end of table.

## Table 1.—Italy: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Pyrite, all kinds: | | | |
| Gross weight ---- thousand tons -- | 1,382 | 1,181 | 1,168 |
| Sulfur content ---- do ---- | 594 | 508 | 502 |
| Salt: | | | |
| Marine, crude ---- do ---- | 719 | 1,165 | e 1,200 |
| Other, including brine ---- do ---- | 3,360 | 3,707 | 4,006 |
| Sand and gravel: | | | |
| Calcareous sand ---- do ---- | e 2,300 | | |
| Silica sand ---- do ---- | 4,367 | | |
| Volcanic sand ---- do ---- | e 200 | NA | NA |
| Other sand and gravel ---- do ---- | e 77,000 | | |
| Stone: | | | |
| Dimension stone: | | | |
| Calcareous: | | | |
| Alabaster and onyx ---- do ---- | 21 | | |
| Gypsum for cutting ---- do ---- | 22 | NA | NA |
| Limestone ---- do ---- | 307 | | |
| Marble in blocks: | | | |
| White ---- do ---- | 836 | | |
| Colored ---- do ---- | 1,085 | 1,299 | 1,325 |
| Schist ---- do ---- | e 50 | | |
| Travertine ---- do ---- | 405 | NA | NA |
| Tufa ---- do ---- | 5,875 | | |
| Other: | | | |
| Diorite ---- do ---- | e 10 | | |
| Gneiss ---- do ---- | 196 | | |
| Granite ---- do ---- | 44 | | |
| Lava, basalt and trachyte ---- do ---- | 115 | | |
| Porphyry ---- do ---- | 189 | | |
| Quartz and quartzite ---- do ---- | 35 | NA | NA |
| Sandstone ---- do ---- | 322 | | |
| Serpentine ---- do ---- | e 600 | | |
| Slate ---- do ---- | 88 | | |
| Syenite ---- do ---- | e 5,000 | | |
| Tuff, volcanic ---- do ---- | 3,517 | | |
| Crushed and broken: | | | |
| Calcareous tufa ---- do ---- | e 3,000 | | |
| Diabase ---- do ---- | e 200 | | |
| Diorite ---- do ---- | e 10 | | |
| Dolomite ---- do ---- | 1,249 | | |
| Granite ---- do ---- | e 123 | NA | NA |
| Lava ---- do ---- | e 1,864 | | |
| Limestone [2] ---- do ---- | 41,245 | | |
| Marble, white and colored ---- do ---- | 1,596 | | |
| Marl for cement ---- do ---- | 7,261 | 7,982 | NA |
| Porphyry ---- do ---- | e 300 | | |
| Quartz and quartzite ---- do ---- | 525 | | |
| Sandstone ---- do ---- | 557 | | |
| Schist ---- do ---- | 24 | NA | NA |
| Serpentine ---- do ---- | e 1,500 | | |
| Travertine ---- do ---- | e 319 | | |
| Tuff, volcanic ---- do ---- | e 3,500 | | |
| Strontium minerals ---- | 735 | 735 | 750 |
| Sulfur, native: | | | |
| Ore ---- | 833,797 | 778,037 | 437,301 |
| Concentrate and filtrate (85% to 90% sulfur) ---- | 77,235 | 70,132 | 64,868 |
| Fused in briquets ---- | 33,919 | 30,383 | 16,326 |
| Talc and related materials ---- | 147,046 | 147,062 | 154,965 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bituminous rock, natural: | | | |
| For distillation ---- | 80,386 | 70,414 | 36,919 |
| For paving ---- | 126,962 | 103,333 | 105,697 |
| Carbon black ---- | 130,785 | 146,796 | 151,544 |
| Coal: | | | |
| Subbituminous (sulcis coal) ---- thousand tons -- | 151 | 5 | 4 |
| Lignite ---- do ---- | 839 | 2,151 | 1,960 |
| Coke: | | | |
| Metallurgical ---- do ---- | r 7,067 | 7,665 | 8,566 |
| Gashouse ---- do ---- | 43 | 259 | -- |
| Gas, natural, marketed production --- million cubic feet -- | r 501,008 | 540,992 | 539,343 |
| Natural gas liquids, natural gasoline thousand 42-gallon barrels -- | 547 | 539 | 615 |
| Petroleum: | | | |
| Crude ---- do ---- | r 7,850 | 7,082 | 6,976 |
| Refinery products: | | | |
| Gasoline ---- do ---- | r 118,032 | 128,263 | 124,959 |
| Jet fuel ---- do ---- | 16,583 | 16,711 | 14,388 |
| Kerosine ---- do ---- | 32,096 | 34,768 | 30,727 |

See footnotes at end of table.

Table 1.—Italy: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Petroleum—Continued | | | | |
| Refinery products—Continued | | | | |
| Distillate fuel oil | thousand 42-gallon barrels | r 187,914 | 215,627 | 217,084 |
| Residual fuel oil | do | 365,660 | 380,950 | 341,046 |
| Lubricants | do | 3,480 | 3,455 | 4,524 |
| Other: | | | | |
| Refinery gas | do | 3,877 | 3,996 | 4,761 |
| Liquefied petroleum gas | do | 25,234 | 26,435 | 25,898 |
| Naphtha | do | 75,236 | 80,051 | 72,203 |
| Paraffin | do | 98 | 98 | 50 |
| Bitumen | do | 13,521 | 13,720 | 11,035 |
| Unspecified | do | r 1,199 | 1,030 | 1,852 |
| Partly refined oil | do | 31,255 | 35,027 | 31,615 |
| Refinery fuel and losses | do | 55,950 | 51,942 | 48,820 |
| Total | do | r 930,135 | 992,073 | 928,962 |

e Estimate. p Preliminary.. r Revised. NA Not available.
1 Excludes pelletized iron oxide derived from pyrite.
2 Limestone used for lime, artificial cement, and construction.

## TRADE

Mineral commodities significantly increased their share of the total value of Italy's foreign trade in 1974. Both, exports and imports increased in value, the former by 58% the latter by 63% compared with 1973. Large increases in imports were reported for crude oil, iron ore, bauxite, and coal. They collectively accounted for over 90% of the value of Italian mineral commodities imports. A gain of over $2.0 billion in exports of mineral commodities resulted from higher shipments of petroleum products, building stone, and finished steel products.

Mineral commodity trade in 1972 and 1973, and the principal items constituting Italy's mineral commodity trade, are shown in tables 2 and 3.

Table 2.—Italy: Exports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite | 8,448 | 8,799 | NA. |
| Ash and residue containing aluminum | 2,046 | 3,317 | NA. |
| Oxide and hydroxide | 567 | 122,121 | New Zealand 36,504; Greece 28,514; Netherlands 22,850. |
| Metal including alloys: | | | |
| Scrap | r 287 | 481 | France 312. |
| Unwrought | 12,479 | 14,122 | France 4,444; West Germany 3,907; Argentina 2,442. |
| Semimanufactures | 56,420 | 55,570 | France 15,155; West Germany 9,808. |
| Antimony metal, all forms, including waste and scrap | 287 | 399 | France 284. |
| Arsenic: | | | |
| Natural sulfides | 20 | 10 | NA. |
| Trioxide, pentoxide, acids | 23 | (1) | NA. |
| Beryllium oxide and hydroxide | 30 | 2,000 | NA. |
| Bismuth metal | 25 | 45 | France 10. |
| Cadmium metal including alloys, all forms | 95 | 16 | NA. |
| Cesium and rubidium | 6 | -- | |
| Chromium: | | | |
| Chromite | 893 | 1,303 | NA. |
| Oxide and hydroxide | 3,008 | 2,010 | United States 961; Japan 304. |
| Metal including alloys, all forms | 37 | 3 | NA. |

See footnotes at end of table.

## Table 2.—Italy: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Cobalt: | | | |
| Oxide and hydroxide | 3 | 1 | NA. |
| Metal including alloys, all forms | 4 | 2 | NA. |
| Columbium and tantalum: | | | |
| Ore and concentrate | 40 | 63 | All to West Germany. |
| Metal, all forms, including waste and scrap | 21 | 11 | West Germany 4. |
| Copper: | | | |
| Ore and concentrate | r 3,828 | 6,564 | Spain 3,717; Greece 1,820; Belgium-Luxembourg 650. |
| Matte | -- | 675 | Mainly to Belgium-Luxembourg. |
| Ash and residue containing copper | 5,944 | 10,622 | West Germany 8,661. |
| Copper sulfate | 1,727 | 146 | NA. |
| Metal including alloys: | | | |
| Scrap | 1,520 | 2,630 | West Germany 1,867; France 461. |
| Unwrought | r 3,877 | 8,319 | West Germany 3,962; Netherlands 2,452. |
| Semimanufactures | 37,803 | 34,910 | West Germany 7,847; France 7,538. |
| Gallium, indium, and thallium kilograms | 988 | 1,300 | Switzerland 700. |
| Germanium do | r 464 | 2,800 | NA. |
| Iron and steel: | | | |
| Ore and concentrate | 141 | 108 | NA. |
| Roasted pyrite thousand tons | 255 | 166 | Austria 99. |
| Metal: | | | |
| Scrap do | 15 | 10 | France 5; West Germany 3; Netherlands 1. |
| Pig iron, including cast iron, spiegeleisen, powder and shot do | 8 | 12 | Greece 2; West Germany 1. |
| Ferroalloys do | 29 | 24 | West Germany 7; Austria 4; France 4. |
| Steel, primary forms do | 385 | 226 | Belgium-Luxembourg 81; France 46; Israel 39. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, and sections do | 1,508 | 1,424 | West Germany 305; Libya 274; France 244. |
| Universals, plates, and sheets do | 1,046 | 812 | France 129; West Germany 120; United States 61. |
| Hoop and strip do | 95 | 62 | France 12; West Germany 7; Yugoslavia 6. |
| Rails and accessories do | 15 | 23 | Arab Republic of Egypt 8; Zaire 6; Switzerland 5. |
| Wire do | 33 | 23 | Algeria 6; Libya 2. |
| Tubes, pipes, and fittings do | 692 | 879 | U.S.S.R. 314; West Germany 72. |
| Castings and forgings do | 78 | 68 | France 16; West Germany 12; Libya 5. |
| Total do | 3,467 | 3,291 | |
| Lead: | | | |
| Ore and concentrate | 23,362 | 12,056 | Austria 6,506; Yugoslavia 3,193; Tunisia 2,250. |
| Ash and residue containing lead | 272 | 773 | NA. |
| Oxide | 10 | 3 | NA. |
| Metal including alloys: | | | |
| Scrap | 32 | 44 | NA. |
| Unwrought | 446 | 1,890 | Yugoslavia 874; Turkey 403. |
| Semimanufactures | r 443 | 1,026 | Libya 786. |
| Magnesium metal including alloys: | | | |
| Scrap | 261 | 168 | NA. |
| Unwrought | 7,420 | 5,673 | Mainly to West Germany. |
| Semimanufactures | 91 | 155 | NA. |
| Manganese: | | | |
| Ore and concentrate | -- | 30 | NA. |
| Oxide and hydroxide | r 13 | 71 | NA. |
| Metal, all forms | (1) | 4 | NA. |
| Mercury 76-pound flasks | r 10,944 | 20,767 | India 4,653; West Germany 2,901; France 2,820. |
| Molybdenum: | | | |
| Ore and concentrate | 936 | -- | |
| Metal including alloys, all forms kilograms | 1,535 | 700 | NA. |
| Nickel: | | | |
| Matte, speiss and similar materials | 21 | 2 | NA. |

See footnotes at end of table.

## Table 2.—Italy: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Nickel—Continued | | | |
| Metal including alloys: | | | |
| Unwrought | 214 | 145 | Yugoslavia 77; Poland 36. |
| Semimanufactures | 1,024 | 571 | Spain 119; Morocco 87; Yugoslavia 70. |
| Platinum-group metals and silver including alloys: | | | |
| Platinum group thousand troy ounces | 77 | 51 | West Germany 39; Belgium-Luxembourg 4. |
| Silver do | 4,420 | 5,469 | West Germany 1,939; United Kingdom 926; Switzerland 781. |
| Rare-earth metals: | | | |
| Oxides and other compounds value | r $7,651 | $18,398 | NA. |
| Metals, cerium | -- | 1 | NA. |
| Selenium, elemental kilograms | r 1,091 | 20,100 | NA. |
| Silicon, elemental | 9,242 | 6,194 | West Germany 3,145; United Kingdom 1,740; Canada 681. |
| Tellurium and arsenic | (1) | 26 | NA. |
| Thorium: | | | |
| Ore and concentrate kilograms | 103,535 | -- | |
| Thoria value | $187 | $395 | NA. |
| Tin: | | | |
| Oxide long tons | r 97 | 93 | France 60. |
| Metal, all forms do | r 126 | 104 | France 67. |
| Titanium: | | | |
| Ore and concentrate | 20 | 2 | NA. |
| Oxides | 24,050 | 30,489 | West Germany 6,535; Poland 4,105; France 2,814. |
| Metal including alloys, all forms | 58 | 46 | West Germany 29. |
| Tungsten metal including alloys, all forms | 11 | 16 | NA. |
| Vanadium oxide and hydroxide kilograms | 2,256 | -- | |
| Zinc: | | | |
| Ore and concentrate | 84 | 28 | NA. |
| Ash and residue containing zinc | 5,006 | 7,071 | West Germany 4,077; Republic of South Africa 2,255. |
| Oxide | 1,998 | 1,291 | France 933. |
| Metal including alloys: | | | |
| Scrap | 38 | (1) | NA. |
| Blue powder | 164 | 169 | NA. |
| Unwrought | 242 | 5,132 | Belgium-Luxembourg 2,647; United States 1,347. |
| Semimanufactures | 610 | 1,037 | Belgium-Luxembourg 170; United States 118; Canada 91. |
| Zirconium: | | | |
| Ore and concentrate | 18 | 147 | NA. |
| Metal including alloys, all forms | r 5 | (1) | NA. |
| Other: | | | |
| Ores and concentrates | 8 | 44 | NA. |
| Ash and residue containing nonferrous metals, n.e.s | 1,427 | 5,566 | West Germany 3,880; United Kingdom 462. |
| Oxides and hydroxides | r 293 | 94 | NA. |
| Metals including alloys, all forms: | | | |
| Metalloids, n.e.s | 25 | 78 | NA. |
| Akali, alkaline earth, rare-earth metals, n.e.s | 1 | 98 | NA. |
| Pyrophoric alloys | (1) | -- | |
| Base metals including alloys, all forms, n.e.s | 1 | 2 | NA. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, corundum, etc | 531,862 | 369,873 | United States 124,505; United Kingdom 107,920; Algeria 51,124. |
| Dust and powder of precious and semiprecious stones value | $1,700 | $6,166 | NA. |
| Grinding and polishing wheels and stones | 7,980 | 9,490 | France 1,661. |
| Asbestos | 54,668 | 62,915 | West Germany 28,031; France 13,055; Spain 4,775. |
| Barite and witherite | 6,539 | 6,672 | NA. |
| Boron materials: | | | |
| Crude natural borates | 745 | 86 | NA. |
| Oxide and acid | 2,401 | 3,712 | West Germany 1,713. |
| Cement thousand tons | 1,086 | 962 | Libya 281; Yugoslavia 267; Switzerland 139. |
| Chalk | 962 | 1,174 | NA. |

See footnotes at end of table.

## Table 2.—Italy: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Clays and clay products (including all refractory brick): | | | |
| Crude n.e.s.: | | | |
| Bentonite | 12,947 | 15,767 | Libya 4,180. |
| Kaolin | r 1,660 | 2,572 | NA. |
| Other | 37,746 | 11,089 | NA. |
| Products: | | | |
| Refractory (including nonclay bricks) | 57,224 | 81,139 | West Germany 11,280; Argentina 6,485. |
| Nonrefractory—thousand tons | 1,122 | 1,210 | France 305; West Germany 248. |
| Cryolite and chiolite | -- | 11 | NA. |
| Diamond: | | | |
| Gem, not set or strung value, thousands | $35 | $80 | NA. |
| Industrial do | r $78 | $98 | NA. |
| Diatomite and other infusorial earth | 1,760 | 1,396 | NA. |
| Feldspar | r 30,936 | 33,092 | West Germany 13,628. |
| Fertilizer materials: | | | |
| Crude | 3,169 | 6,205 | Mainly to France. |
| Manufactured: | | | |
| Nitrogenous—thousand tons | 1,196 | 1,040 | Turkey 322; People's Republic of China 304. |
| Phosphatic do | 3 | 19 | NA. |
| Potassic do | 13 | 26 | Algeria 9; Greece 7; Tunisia 4. |
| Other do | 245 | 199 | Turkey 51; France 46; Zambia 31. |
| Ammonia | r 11,632 | 17,350 | Greece 10,642; U.S.S.R. 1,950. |
| Fluorspar | 67,060 | 91,047 | United States 65,976; West Germany 6,542. |
| Graphite, natural | 1,497 | 2,295 | France 1,724. |
| Gypsum and plasters | 18,365 | 20,798 | NA. |
| Lime | 90,800 | 88,696 | Libya 46,917; Switzerland 35,759. |
| Lithium ore | 38 | -- | |
| Magnesite | r 96 | 435 | NA. |
| Mica: | | | |
| Crude, including splittings and waste | 305 | 206 | NA. |
| Worked, including agglomerated splittings | 53 | 70 | NA. |
| Pigments, mineral, including processed iron oxides | 1,219 | 1,839 | NA. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural value, thousands | $222 | $34 | NA. |
| Manufactured kilograms | 347 | 275 | NA. |
| Pyrite (gross weight) | 11,438 | 6,901 | NA. |
| Salt, all forms | 261,301 | 97,643 | Portugal 13,530. |
| Sodium and potassium compounds: | | | |
| Caustic soda | 341,483 | 361,479 | Yugoslavia 70,003; U.S.S.R. 44,730 Arab Republic of Egypt 34,922. |
| Caustic potash | 852 | 1,354 | NA. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous | 281,010 | 282,590 | West Germany 37,532; France 34,274; Libya 24,422. |
| Slate | 2,902 | 3,422 | NA. |
| Other | 61,989 | 66,977 | Switzerland 12,952; West Germany 11,817; France 6,497. |
| Worked, all forms | 745,812 | 839,801 | West Germany 448.722; France 138,944; United States 92,647. |
| Dolomite, all grades | 23,955 | 25,436 | Switzerland 6,770; Argentina 3,214. |
| Gravel and crushed rock | r 507,532 | 592,576 | West Germany 143,052; Libya 91,294; Switzerland 61,847. |
| Limestone (except dimension) | 256 | 382 | NA. |
| Quartz and quartzite: | | | |
| Piezoelectric crystal kilograms | 11 | -- | |
| Other | 34,371 | 26,460 | NA. |
| Sand, excluding metal bearing | 694,608 | 697,259 | Mainly to Switzerland. |
| Sulfur: | | | |
| Elemental, all forms | 4,557 | 4,570 | NA. |
| Sulfur dioxide | r 31 | 39 | NA. |
| Sulfuric acid | 307 | 10,188 | NA. |
| Talc, steatite, and soapstone | 59,635 | 49,082 | West Germany 17,255; United Kingdom 6,780; United States 5,622. |
| Other: | | | |
| Slag, dross and similar waste, not metal bearing | 213,042 | 223,167 | Yugoslavia 151,347. |

See footnotes at end of table.

## Table 2.—Italy: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Other—Continued | | | |
| Oxides, hydroxides, and peroxides of magnesium, strontium, and barium | r 1,937 | 1,592 | West Germany 378. |
| Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s | 60,247 | 82,103 | France 35,293; West Germany 13,269. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 927 | 1,033 | NA. |
| Carbon black and gas carbon | 37,797 | 48,143 | Turkey 10,801; Austria 9,768; Yugoslavia 6,691. |
| Coal, all grades, including briquets | 2,030 | 3,077 | NA. |
| Coke and semicoke | r 526,512 | 612,997 | Romania 147,188; Algeria 146,534. |
| Peat | 83 | 82 | NA. |
| Petroleum refinery products: | | | |
| Gasoline thousand 42-gallon barrels | 49,800 | 50,142 | United Kingdom 9,775; Netherlands 6,768; France 6,739. |
| Kerosine do | r 22,560 | 25,304 | Netherlands 3,112; Greece 2,966. |
| Distillate fuel oil do | 63,574 | 72,989 | Netherlands 14,234; West Germany 12,801; France 11,675. |
| Residual fuel oil do | 102,677 | 93,606 | United States 33,620. |
| Lubricants do | 1,758 | 1,677 | Switzerland 342; United Kingdom 144. |
| Other: | | | |
| Liquefied petroleum gas do | r 3,691 | 4,424 | Spain 632; Arab Republic of Egypt 575; Algeria 488. |
| Mineral jelly and wax do | 9 | 12 | NA. |
| Bitumen and other residues do | 1,051 | 1,358 | Austria 652; Libya 278; Yugoslavia 180. |
| Bituminous mixtures, n.e.s. do | 139 | 177 | Libya 107; Yugoslavia 15. |
| Petroleum coke and pitch coke do | 329 | 290 | Switzerland 127; France 86; Greece 48. |
| Total do | r 245,088 | 249,979 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 46,885 | 33,173 | United States 18,355; Yugoslavia 6,594. |

r Revised. NA Not available.
1 Less than ½ unit.

## Table 3.—Italy: Imports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite | 676,158 | 815,876 | Australia 454,266; Yugoslavia 219,365. |
| Ash and residue containing aluminum | 35,636 | 41,191 | Austria 20,092; France 5,140; West Germany 4,833. |
| Oxide and hydroxide | 189,205 | 188,857 | France 119,657; Greece 26,437; Yugoslavia 22,621. |
| Metals including alloys: | | | |
| Scrap | 59,605 | 63,256 | France 12,817; Austria 12,032; West Germany 11,297. |
| Unwrought | 173,277 | 185,558 | France 43,129; Norway 35,584; Greece 34,273. |
| Semimanufactures | 34,647 | 46,746 | West Germany 17,507; France 11,054; Belgium-Luxembourg 5,648. |
| Antimony: | | | |
| Ore and concentrate | 1,464 | 2,705 | Canada 1,442; Thailand 629; Bolivia 292. |
| Metal including alloys, all forms | 200 | 172 | NA. |
| Arsenic trioxide, pentoxide, and acids | 1,925 | 1,082 | NA. |

See footnotes at end of table.

## Table 3.—Italy: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Beryllium metal including alloys, all forms ____ kilograms __ | 3,936 | 8,300 | NA. |
| Bismuth metal including alloys, all forms ____ | 195 | 185 | France 141. |
| Cadmium ____ | 33 | 96 | NA. |
| Chromium: | | | |
| Chromite ____ | 193,611 | 188,070 | Albania 67,208; U.S.S.R. 53,835; Turkey 37,908. |
| Oxide and hydroxide ____ | 1,900 | 1,528 | West Germany 1,117; United States 151. |
| Metal including alloys, all forms __ | 209 | 296 | West Germany 151; France 49. |
| Cobalt: | | | |
| Oxide and hydroxide ____ | 230 | 301 | Belgium-Luxembourg 270. |
| Metal including alloys, all forms __ | r 354 | 401 | Belgium-Luxembourg 261; United Kingdom 59. |
| Columbium and tantalum: | | | |
| Ore and concentrate ____ | 110 | 171 | West Germany 80. |
| Metal, all forms, including waste and scrap ____ | 9 | 412 | NA. |
| Copper: | | | |
| Matte ____ | 728 | -- | |
| Ash and residue containing copper | 424 | 1,338 | NA. |
| Copper sulfate ____ | 5,233 | 6,555 | Yugoslavia 4,848; France 865. |
| Metal including alloys: | | | |
| Scrap ____ | 48,819 | 57,013 | France 17,028; West Germany 14,705; United States 10,052. |
| Unwrought ____ | 315,759 | 295,826 | Zambia 70,835; Zaire 61,983; Chile 46,826. |
| Semimanufactures ____ | 17,510 | 27,756 | West Germany 11,036; Belgium-Luxembourg 5,063 France 4,438. |
| Gallium, indium, and thallium kilograms __ | 355 | 900 | NA. |
| Germanium ____ do ____ | 7,332 | 4,100 | Belgium-Luxembourg 3,500. |
| Iron and steel: | | | |
| Ore and concentrate thousand tons __ | 13,308 | 14,194 | Liberia 3,764; Canada 1,943; Brazil 1,933. |
| Roasted pyrites ____ do ____ | -- | 2 | NA. |
| Metal: | | | |
| Scrap ____ do ____ | 5,679 | 5,605 | France 2,123; West Germany 1,868; U.S.S.R. 526. |
| Pig iron, including cast iron and spiegeleisen ____ do ____ | r 1,176 | 1,017 | West Germany 250; U.S.S.R. 227; Yugoslavia 128. |
| Sponge iron, powder and shot ____ do ____ | 16 | 17 | Sweden 8; France 6. |
| Ferroalloys: | | | |
| Ferromanganese __ do ____ | 88 | 121 | France 69; Belgium-Luxembourg 12. |
| Other ____ do ____ | 101 | 122 | France 26; Norway 19; Yugoslavia 14. |
| Steel, primary forms _ do ____ | 2,572 | 2,157 | West Germany 458; Belgium-Luxembourg 275; France 270. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, and sections ____ do ____ | 501 | 723 | West Germany 184; France 165; Belgium-Luxembourg 137. |
| Universals, plates, and sheets ____ do ____ | 1,247 | 1,576 | France 348; West Germany 279; Belgium-Luxembourg 248. |
| Hoop and strip __ do ____ | 160 | 228 | France 73; West Germany 47; Belgium-Luxembourg 29. |
| Rails and accessories do ____ | 109 | 133 | West Germany 50; France 49; Belgium-Luxembourg 16. |
| Wire ____ do ____ | 45 | 61 | Belgium-Luxembourg 25; France 11; Yugoslavia 6. |
| Tubes, pipes, and fittings ____ do____ | 163 | 274 | West Germany 93; France 69. |
| Castings and forgings do ____ | 27 | 27 | West Germany 12; France 8. |
| Total ____ do ____ | 2,252 | 3,022 | |
| Lead: | | | |
| Ore and concentrate ____ | 24,699 | 38,478 | Greece 14,702; Canada 14,355; Poland 9,395. |
| Ash and residue containing lead __ | 17,932 | 3,645 | Yugoslavia 1,818. |
| Oxide ____ | 6,108 | 19,646 | Mexico 10,269; France 5,530; West Germany 1,555. |

See footnotes at end of table.

## Table 3.—Italy: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Lead—Continued | | | |
| Metal including alloys: | | | |
| Scrap | 20,874 | 20,263 | France 7,092; Switzerland 6,121; West Germany 2,757. |
| Unwrought | 150,832 | 141,125 | West Germany 34,166; Mexico 24,857. |
| Semimanufactures | 795 | 1,562 | West Germany 82. |
| Lithium | 8 | 36 | United States 6. |
| Magnesium metal including alloys: | | | |
| Scrap | 943 | 1,820 | West Germany 1,447. |
| Unwrought | 851 | 1,365 | United States 1,033. |
| Semimanufactures | 58 | 253 | NA. |
| Manganese: | | | |
| Ore and concentrate | 283,343 | 282,057 | Republic of South Africa 159,772; Gabon 91,902. |
| Oxides | 1,441 | 2,191 | Belgium-Luxembourg 1,043; Japan 297. |
| Metal, all forms | 2,033 | 2,483 | France 1,209; Republic of South Africa 817. |
| Mercury 76-pound flasks | 5,300 | 5,178 | Mainly from Yugoslavia. |
| Molybdenum: | | | |
| Ore and concentrate | 5,705 | 6,681 | Netherlands 3,727; United States 1,757. |
| Metal including alloys, all forms | 54 | 92 | Austria 36. |
| Nickel: | | | |
| Matte, speiss and similar materials | 4,349 | 5,152 | Canada 3,672; Cuba 928. |
| Metal including alloys: | | | |
| Scrap | 1,220 | 1,383 | Canada 614; Switzerland 197. |
| Unwrought | 14,229 | 14,276 | United Kingdom 2,486. |
| Semimanufactures | 2,531 | 2,579 | United Kingdom 737; West Germany 728; United States 415. |
| Platinum-group metals and silver including alloys: | | | |
| Platinum group thousand troy ounces | r 425 | 1,034 | West Germany 427; France 193. |
| Silver do | 48,627 | 53,923 | United Kingdom 17,792; United States 14,574; West Germany 9,674. |
| Rare-earth metals: | | | |
| Oxides and other compounds value, thousands | r $577 | $549 | France $391. |
| Metals: | | | |
| Cerium | 71 | 93 | West Germany 50. |
| Other | 154 | 351 | West Germany 204; United States 79; Austria 50. |
| Selenium, elemental | 37 | 57 | Japan 19; West Germany 18. |
| Silicon, elemental | 320 | 1,504 | Yugoslavia 375. |
| Tellurium and arsenic | 92 | 54 | NA. |
| Thoria value | r $85,841 | $200,873 | NA. |
| Tin: | | | |
| Oxide long tons | 9 | 62 | NA. |
| Metal including alloys: | | | |
| Scrap do | 25 | 5 | NA. |
| Unwrought do | r 8,018 | 9,608 | Malaysia 5,665; Indonesia 942; Thailand 884. |
| Semimanufactures do | r 167 | 180 | West Germany 75; Netherlands 61; Belgium-Luxembourg 25. |
| Titanium: | | | |
| Ore and concentrate | 133,477 | 124,514 | Mainly from Norway. |
| Oxides | 45,261 | 39,626 | West Germany 18,390; France 9,523; Netherlands 4,089. |
| Metal including alloys, all forms | r 1,290 | 1,737 | United States 995; U.S.S.R. 348. |
| Tungsten: | | | |
| Ore and concentrate | 100 | 175 | NA. |
| Metal including alloys, all forms | 53 | 69 | Netherlands 3. |
| Uranium metal | 24 | 14 | NA. |
| Vanadium oxide and hydroxide | 881 | 923 | West Germany 550; Netherlands 337. |
| Zinc: | | | |
| Ore and concentrate | 147,948 | 227,055 | Canada 62,628; Mexico 29,988; Peru 29,669. |
| Ash and residue containing zinc | 4,354 | 4,915 | Switzerland 2,024; Belgium-Luxembourg 1,789; West Germany 534. |
| Oxide and hydroxide | 4,329 | 5,025 | France 1,351; Netherlands 969; West Germany 896. |

See footnotes at end of table.

## Table 3.—Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Zinc—Continued | | | |
| Metal including alloys: | | | |
| Scrap | 4,228 | 4,641 | France 1,556; West Germany 1,374; Switzerland 718. |
| Blue powder | 2,253 | 1,632 | Belgium-Luxembourg 1,426. |
| Unwrought | 47,463 | 61,477 | West Germany 18,712; Belgium-Luxembourg 11,668; Zaire 5,485. |
| Semimanufactures | 5,271 | 5,942 | Belgium-Luxembourg 3,277; West Germany 1,980. |
| Zirconium: | | | |
| Ore and concentrate | 33,280 | 36,127 | Mainly from Australia. |
| Metal including alloys, all forms kilograms | 7,683 | 67,300 | NA. |
| Other: | | | |
| Ore and concentrate | 4,335 | 18,090 | Canada 11,983; Ireland 5,790. |
| Ash and residue containing nonferrous metals, n.e.s | 8,074 | 23,064 | Canada 17,299. |
| Oxides and hydroxides | r 1,889 | 2,166 | West Germany 495; Cuba 397; Belgium-Luxembourg 386. |
| Metals including alloys, all forms: | | | |
| Metalloids | 2,091 | 117 | NA. |
| Alkali, alkaline earth and rare-earth metals, n.e.s | 8,515 | 6,783 | West Germany 5,229; France 957; U.S.S.R. 581. |
| Pyrophoric alloys | 21 | 9 | NA. |
| Base metals including alloys, all forms, n.e.s | r 97 | 45 | NA. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, etc | 2,058 | 1,771 | NA. |
| Dust and powder of precious and semiprecious stones value, thousands | $4,504 | $7,054 | Zaire $2,168; United States $2,043; Netherlands $860. |
| Grinding and polishing wheels and stones | 3,862 | 3,812 | Austria 947; United Kingdom 726; West Germany 623. |
| Asbestos | 47,753 | 60,183 | Republic of South Africa 31,275; Canada 20,556; U.S.S.R. 5,511. |
| Barite and witherite | 53,296 | 36,041 | Spain 18,470; Tunisia 11,256. |
| Boron materials: | | | |
| Crude natural borates | r 112,420 | 106,078 | Turkey 64,380; United States 29,526. |
| Oxide and acid | 421 | 1,043 | Belgium-Luxembourg 597. |
| Cement | 56,242 | 59,336 | France 40,333; Spain 6,938; Yugoslavia 6,741. |
| Chalk | 7,702 | 7,607 | Mainly from France. |
| Clays and clay products: | | | |
| Clay: | | | |
| Bentonite | 20,220 | 25,872 | Greece 17,486. |
| Kaolin | 515,919 | 634,696 | United Kingdom 339,420; United States 132,632. |
| Other | 689,982 | 651,646 | France 225,585; West Germany 203,462; United Kingdom 92,997. |
| Products: | | | |
| Refractory | 127,245 | 141,542 | West Germany 45,941; Austria 28,556; France 20,799. |
| Nonrefractory | 33,396 | 33,681 | Mainly from West Germany. |
| Cryolite and chiolite | 605 | 471 | Mainly from Denmark. |
| Diamond: | | | |
| Gem, not set or strung value, thousands | $3,171 | $16,088 | Belgium-Luxembourg $10,329; Israel $2,116; Netherlands $1,567. |
| Industrial do | r $1,042 | $3,281 | Belgium-Luxembourg $2,476; Netherlands $451. |
| Diatomite and other infusorial earth | 4,831 | 5,545 | West Germany 1,956. |
| Feldspar | 24,052 | 21,991 | United Kingdom 2,670. |
| Fertilizer materials: | | | |
| Crude thousand tons | 2,227 | 1,847 | Morocco 1,061; United States 528; Israel 103. |
| Manufactured: | | | |
| Nitrogenous | 148,031 | 69,894 | France 18,054; United States 16,512; West Germany 11,333. |
| Phosphatic | 208,540 | 178,103 | Tunisia 55,710; France 54,228; Belgium-Luxembourg 29,939. |
| Potassic | 210,090 | 315,174 | Israel 88,355; France 86,361; U.S.S.R. 76,173. |
| Other | 310,600 | 186,736 | United States 106,859; Yugoslavia 38,991. |
| Ammonia | 19,703 | 7,170 | Algeria 4,483; Portugal 2,584. |

See footnotes at end of table.

## Table 3.—Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fluorspar | 71,671 | 37,457 | France 13,093; Mexico 8,490; Tunisia 6,400. |
| Graphite, natural | 6,930 | 4,796 | West Germany 2,244. |
| Gypsum and plasters | 2,644 | 2,761 | United States 1,102. |
| Lime | 100 | 84 | NA. |
| Lithium ore | 912 | 1,073 | NA. |
| Magnesite | 49,017 | 56,981 | Greece 20,777; Ireland 11,036; Austria 7,903. |
| Mica: | | | |
| Crude, including splittings and waste | 1,685 | 1,148 | India 150. |
| Worked, including agglomerated splittings | 200 | 279 | Belgium-Luxembourg 68; France 17. |
| Pigments, mineral, iron oxides | r 18,619 | 23,906 | West Germany 14,305. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural value, thousands | $1,236 | $673 | NA. |
| Manufactured kilograms | 12,495 | 23,344 | Switzerland 17,376; France 3,730. |
| Pyrite, gross weight thousand tons | 453 | 301 | U.S.S.R. 259; Cyprus 30. |
| Salt | 3,811 | 200,041 | Mainly from Netherlands. |
| Sodium and potassium compounds | r 47,612 | 34,659 | France 25,531. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous, including marble | 161,431 | 161,118 | Portugal 44,467; Yugoslavia 39,202; Iran 17,835. |
| Slate | 3,203 | 2,904 | NA. |
| Other | r 129,068 | 154,584 | Republic of South Africa 57,334; Norway 23,360; Sweden 14,866. |
| Worked, all forms | 3,735 | 3,991 | West Germany 1,212; France 669; Norway 568. |
| Dolomite | 2,107 | 1,720 | Mainly from Morocco. |
| Gravel and crushed rock | 7,824 | 10,673 | Iran 827. |
| Limestone (except dimension) | 576 | 484 | NA. |
| Quartz and quartzite: | | | |
| Piezoelectric crystal kilograms | 225 | 518 | NA. |
| Other | r 94,006 | 114,409 | Portugal 49,751; Switzerland 27,221; Germany 20,768. |
| Sand, excluding metal bearing thousand tons | 1,180 | 1,052 | Belgium-Luxembourg 468; France 443. |
| Sulfur: | | | |
| Elemental, all forms | 341,949 | 419,607 | Canada 188,755; Poland 146,532; France 46,262. |
| Sulfur dioxide | 463 | 123 | NA. |
| Sulfuric acid | 91,488 | 76,568 | Greece 40,549; Turkey 12,430; West Germany 11,852. |
| Talc, steatite, soapstone, and pyrophyllite | 19,606 | 20,139 | Austria 12,313. |
| Other: | | | |
| Slag, dross, and similar waste, not metal bearing | 14,228 | 26,209 | Austria 5,773; France 3,137. |
| Oxides and hydroxides of strontium, barium and magnesium | r 2,166 | 4,531 | People's Republic of China 2,025; West Germany 928; United States 782. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 18,944 | 24,482 | Yugoslavia 8,128; France 5,348; Austria 3,130. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen | r 2,043 | 1,821 | Mainly from United States. |
| Carbon black and gas carbon | 27,339 | 31,395 | France 11,926; West Germany 6,605; Netherlands 4,341. |
| Coal and briquets: | | | |
| Anthracite and bituminous thousand tons | 10,756 | 10,749 | United States 2,891; Poland 2,721; West Germany 2,540. |
| Briquets of bituminous coal and anthracite do | 27 | 11 | France 8; West Germany 3. |
| Lignite and lignite briquets do | 140 | 111 | West Germany 55; Yugoslavia 38; East Germany 14. |
| Coke and semicoke do | r 130 | 111 | France 63; Hungary 23. |
| Gas, natural, liquefied million cubic feet | 53,630 | 76,691 | All from Libya. |
| Peat thousand tons | 29 | 30 | West Germany 14; Poland 5. |

See footnotes at end of table.

**Table 3.—Imports of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | r 886,584 | 784,764 | Saudi Arabia 257,417; Libya 190,123; Iraq 138,889. |
| Refinery products: | | | |
| Gasoline do | 7,473 | 7,963 | U.S.S.R. 3,015; Belgium-Luxembourg 736. |
| Kerosine do | 1,010 | 999 | U.S.S.R. 306; Saudi Arabia 234; Trinidad and Tobago 201. |
| Distillate fuel oil do | 7,497 | 3,601 | U.S.S.R. 1,788; France 457; Spain 445. |
| Residual fuel oil do | r 18,668 | 17,676 | U.S.S.R. 4,388; Greece 4,184; France 2,552. |
| Lubricants do | 1,351 | 1,289 | United States 389; France 236; United Kingdom 196. |
| Other: | | | |
| Liquefied petroleum gas do | 1,276 | 476 | Yugoslavia 247; Spain 58; Hungary 44. |
| Mineral jelly and wax do | 365 | 445 | West Germany 116; Hungary 55. |
| Bitumen and other residues do | 2,030 | 1,799 | United States 1,225; Albania 537. |
| Bituminous mixtures, n.e.s. do | r 33 | 35 | France 13; United States 9. |
| Petroleum coke and pitch coke do | 1,699 | 3,481 | United States 2,319; Albania 488. |
| Total do | r 41,402 | 37,764 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 52,501 | 60,107 | France 13,899; West Germany 11,523; Netherlands 7,435. |

r Revised. NA Not available.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Production of primary aluminum increased by 28,046 tons in 1974 and was more than 15% higher than that of 1973. Most of the output came from smelters of Società Alluminio e Metalli S.p.A. (Alumetal) at Bolzano, Mori, and Fusina operated by Ente Partecipazioni e Finanziamento Industria Manifatturiera S.p.A. (EFIM). Other producers of primary aluminum were Società Alluminio Veneto per Azioni S.p.A. (SAVA) at Fusina and Porto Marghera, and Alcan Alluminio Italiano, a Canadian subsidiary, at Borgo Franco.

Domestic production of bauxite declined 37% from that of 1973. The decline was due to reduced production from residual vein deposits at the S. Giovanni Rotondo mine in Sardinia. Italy's lower production was balanced by an increase in imports in 1974, principally from Australia, Yugoslavia, Guinea, and Sierra Leone. Azienda Minerali Metallici Italiane S.p.A. (AMMI) conducted research on extensive leucite deposits in Sardinia as a substitute for bauxite.

Consumption of aluminum increased to over 450,000 tons in 1974. The demand for aluminum increased because of improvement in economic conditions during most of 1974. The transportation industry consumed 29%; construction, furniture, and appliance industries, 30%; packing and electrical industries, 19%; and the remaining 22% tons was for other sectors of the economy. Italy's primary aluminum industry ranked sixth in volume among West European countries. The industry produced about 6% of the total primary aluminum production in the world.

Government participation in the aluminum metal industry coupled with several expansion projects was expected to increase production to 300,000 tons per year. EFIM acquired 50% interest in an aluminum smelter, extrusion plant, and an aluminum rolling mill from SAVA.

**Antimony.**—Output of antimony ore decreased by 130 tons in 1974 and was 10% lower than that of 1973. Lower production

was due to a decrease in the grade of ore at the Tafone mine near Grosseto. Domestic and imported stibnite ores were processed to regulus at the AMMI operated smelter near Manciano.

**Copper.**—Output of copper concentrate totaled 1,073 tons of contained metal, an increase of 25% from that of 1973. Increased mine production at the Torrento Otro mine near Vercelli and at the Funtana Ramirosa mine near Gadoni accounted for the higher copper output.

Italy's increasing requirement for copper metal was balanced by imports from Zambia, Zaire, and Chile. The three countries supplied over 60% of total imports.

Italrame S.p.A. was building a 100,000 tons copper rod manufacturing facility near Avellino. The $16 million investment, a joint venture of three companies namely, Società Metallurgica Italiana S.p.A. (SMI), Industriale Pirelli S.p.A., and Trafileria Laminati di Metali S.p.A. SMI, a state-controlled metals fabricating agency, will manage the company and supply copper rods to other wire plants operated by the partnership.

To assure an adequate supply of copper metal for Italy's industrial complexes, EGAM was negotiating joint venture investment type agreements in exploration and development of copper resources with underdeveloped countries.

The construction of a copper refinery and smelter based on concentrate imported from Canada and Australia announced in 1971 remained in the negotiating stages.

**Iron and Steel.**—The Italian iron and steel industry is the third largest among the countries in the European Coal and Steel Community (ECSC) and the fourth largest in Western Europe. Output of raw steel in 1974 was significantly higher than in 1973 and accounted for nearly 18% of ECSC steel production. Linz-Donawitz (LD) converters were the main source of steel (10.4 million tons), while electric furnaces yielded 9.9 million tons. Open-hearth furnaces produced about 3.5 million tons.

At yearend, steel production capacity was reported at 30.4 million tons, an increase of nearly 3 million tons over that of 1973. The iron and steel industry operated at about 78% of its theoretical capacity. Salient statistics on Italian steel production for 1974 are shown in table 4.

Steel consumption totaled about 22.8 million tons, approximately that reported in 1973. Continued strong steel consumption reflected a rise in consumer durables, residential and commercial construction, shipbuilding, and manufacture of trucks and buses.

Per capita steel consumption in Italy was 416 kilograms in 1974 compared with 385 kilograms in 1973 and an average of 535 kilograms for European Communities (EC) countries.

## Table 4.—Salient statistics on iron and steel production
(Metric tons)

| Year | Pig iron | | | Ferro-alloys | Crude steel | | | | | Hot rolled steel [1] | Iron rolled from rerolled scrap | Other finished products [2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blast furnace | Electric furnace | Total | | Open hearth furnace | Electric furnace | Converter | Other | Total | | | |
| 1955 | 1,371,423 | 253,489 | 1,624,912 | 105,884 | 3,051,609 | 2,140,632 | 355,398 | -- | 5,547,639 | 3,999,681 | 25,543 | 179,595 |
| 1956 | 1,643,351 | 230,075 | 1,873,426 | 120,146 | 3,371,761 | 2,370,255 | 333,614 | -- | 6,075,630 | 4,415,927 | 20,722 | 184,661 |
| 1957 | 1,841,953 | 229,957 | 2,071,910 | 134,511 | 3,895,782 | 2,704,078 | 379,573 | -- | 6,979,433 | 5,013,827 | 106,907 | 201,059 |
| 1958 | 1,837,950 | 221,810 | 2,059,760 | 107,332 | 3,611,693 | 2,501,457 | 335,901 | -- | 6,449,051 | 4,635,247 | 119,467 | 172,426 |
| 1959 | 1,885,815 | 211,885 | 2,097,700 | 94,227 | 3,751,447 | 2,802,994 | 399,358 | -- | 6,953,799 | 5,083,858 | 118,508 | 163,555 |
| 1960 | 2,373,251 | 309,590 | 2,682,841 | 141,421 | 4,601,144 | 3,411,849 | 449,075 | -- | 8,462,068 | 6,483,664 | 146,905 | 209,019 |
| 1961 | 2,771,248 | 285,102 | 3,056,350 | 145,093 | 4,985,905 | 3,765,203 | 632,178 | -- | 9,383,286 | 7,043,353 | 154,721 | 242,424 |
| 1962 | 3,306,928 | 249,055 | 3,555,983 | 121,610 | 5,159,850 | 3,960,039 | 636,932 | 628 | 9,757,449 | 7,386,014 | 161,167 | 242,304 |
| 1963 | 3,508,420 | 232,245 | 3,740,665 | 127,181 | 5,266,088 | 4,234,627 | 655,075 | 742 | 10,156,532 | 7,835,109 | 144,937 | 227,429 |
| 1964 | 3,249,071 | 248,714 | 3,497,785 | 126,902 | 4,885,534 | 4,226,252 | 680,055 | 1,443 | 9,793,284 | 7,617,248 | 124,427 | 200,545 |
| 1965 | 5,252,462 | 237,469 | 5,489,931 | 141,303 | 5,145,530 | 4,745,011 | 2,789,020 | 1,842 | 12,681,403 | 9,780,014 | 88,922 | 208,056 |
| 1966 | 6,081,965 | 176,955 | 6,258,920 | 157,874 | 4,954,566 | 4,970,084 | 3,711,433 | 2,528 | 13,638,611 | 10,329,333 | 73,768 | 229,674 |
| 1967 | 7,052,285 | 242,087 | 7,294,372 | 169,891 | 5,618,133 | 5,997,357 | 4,271,639 | 2,733 | 15,889,862 | 12,155,748 | 78,396 | 298,662 |
| 1968 | 7,619,043 | 206,674 | 7,825,717 | 167,605 | 5,664,615 | 6,427,013 | 4,868,857 | 3,043 | 16,963,528 | 13,247,957 | 74,660 | 319,550 |
| 1969 | 7,542,297 | 238,224 | 7,780,521 | 166,965 | 5,204,306 | 6,554,149 | 4,665,995 | 3,685 | 16,428,135 | 13,352,843 | 65,658 | 333,428 |
| 1970 | 8,109,164 | 222,397 | 8,331,561 | 196,959 | 4,840,615 | 6,994,117 | 5,437,700 | 4,832 | 17,277,264 | 13,928,820 | 67,782 | 360,899 |
| 1971 | 8,411,182 | 125,154 | 8,536,336 | 191,076 | 3,998,760 | 7,072,606 | 6,375,386 | 5,174 | 17,451,926 | 13,968,892 | 64,603 | 327,592 |
| 1972 | 9,347,366 | 67,732 | 9,415,098 | 219,000 | 3,988,286 | 8,075,239 | 7,745,012 | 6,068 | 19,814,605 | 15,341,514 | 65,629 | 280,693 |
| 1973 | 9,975,900 | 56,600 | 10,032,500 | 238,472 | 3,627,900 | 8,633,000 | 8,727,600 | 6,500 | 20,995,000 | 17,287,900 | r 74,328 | 293,000 |
| 1974 | 11,623,362 | 62,405 | 11,685,767 | 248,814 | 3,510,872 | 9,860,208 | 10,423,789 | 7,654 | 23,802,523 | 19,153,135 | 74,856 | 291,219 |

r Revised.
[1] Rolled-steel structurals; plates, sheets, tin plates, wire rods, rails, etc.
[2] Including forged steel castings and other finished products, excluding welded tubes.

Source: Associaziono Nazionale Industrie Siderurgiche (ASSIDER).

Italy was both an exporter and importer of steel. The 1974 steel imports were 6.2 million tons while exports totaled 6.3 million tons. As in past years, importation of steel came principally from EC countries. Italian steel exports, however, tend to be heavily biased toward finished products such as steel pipes with a far higher added value than semifinished products which form the bulk of the imports. In terms of value, exports exceeded imports by $34.8 million.

Italian steel consumption was expected to reach about 30 million tons annually by 1980. Società Finanziaria Siderurgica S.p.A. (Finsider) anticipates that domestic steel capacity must expand to an estimated 36 million tons annually during the period. To utilize this mill capacity, the steel industry envisages the need to construct steel plants in foreign countries having large deposits of iron ore. These overseas plants would produce steel ingots, blooms, and slabs for export to Italy for finishing into various steel products.

Improvement of port facilities continued at the Taranto steel complex. The Port of Taranto authority was constructing a large pier and a breakwater to provide space for the increase in volume in water transportation. An estimated $50 million was authorized for the project.

Expansion of the Taranto steel works was continued during 1974. The $2 billion project began in 1970 and was expected to be completed in 1975. The complex was designed to produce at a rate of 10 million tons per year. It encompasses an area of over 2,500 acres, containing 160 miles of railroad trackage, 42 miles of street and about 35 miles of conveyor belting. A work force totaling some 19,000 employees is utilized to operate the steel complex.

At yearend, a second of two twin-strand, continuous slab casting machines was installed at a plant within the Taranto steel complex. A number of innovations were incorporated in the machines, including ladle turrets with independent movable swivel arms of 500–ton load capacity, insertion of a dummy bar from top of the mold, adjustable mold, cooling grids below the molds for high casting speeds, and an adjustable spray cooling system. The machines were designed and manufactured by Schloeman-Siemag of West Germany, and installation and plant construction were conducted in cooperation with Innocenti-Santenstacchio, S.p.A., an Italian firm. Also, a fifth blast furnace and a third continuous casting process were in operation at yearend.

Finsider announced an agreement to supply 2.5 million tons of 56-inch-diameter welded steel pipe to the U.S.S.R. in exchange for iron ore, coal, and other undisclosed raw minerals. The value of the pipe was reported at $1.5 billion and its delivery scheduled over a 5-year period at a rate of 500,000 tons per year. The pipe will be manufactured to withstand high pressure and for service in arctic areas of subzero temperatures. The Taranto pipe mill produced 866,000 tons of line pipe in 1974.

Two 250-ton converters were installed at the Altie Fornie e Acciaierie Riunite Ilva e Cornigliano S.p.A. near Genoa to replace existing open-hearth furnaces. The converters, employing a steel-making process developed by Maxhütte of West Germany, will be installed by the developing company and United States Steel Corp. Raw steel capacity at the facility was unchanged and remained at 2.3 million tons per year. The company installed computer quality control on its tin plate production line. The unit will automatically detect and correct defects in tin plate. At yearend, the installation of a continuous casting process was underway.

Dalmine S.p.A. steelworks in Taranto continued construction of an electric furnace having a continuous steel pouring unit. The steel making section is modular in design, hence easily expanded. The company plans to construct two additional modules costing $26 million which will produce 200,000 tons of steel annually.

Dalmine initiated production of line pipe employing the Fretz-Moon solder process. The plant was designed to produce 400,000 tons of line pipe per year.

*Iron Ore.*—Domestic output of iron ore rose 26% above that mined in 1973. Italy's iron ore comes from the Elba mines operated by Italsider S.p.A. The grade of the iron ore mined was 44% iron, same as in 1973.

The Nation imports most of its iron ore requirements. In 1974, 18.1 million tons were received from Liberia, Brazil, Canada, Australia, and three other countries; Liberia supplied over 42% of the imports.

*Pig Iron.*—Production of pig iron increased from 10.0 million to 11.7 million tons in 1974, an increase of over 15%. Blast furnaces were the principal sources of pig iron accounting for 11.6 million tons; the remaining 0.1 million tons came from electric furnaces. Italsider remained the largest producer of pig iron in Italy, accounting for over 90% of output. Imports of pig iron from four countries totaled over 1 million tons with West Germany supplying over 38% of the total. The industry's pig iron to steel ratio was 49.1% compared with 47.8% in 1973.

*Iron and Steel Scrap.*—Consumption of iron and steel scrap in steelmaking totaled 14.5 million tons in 1974, or about 13% more than that of 1973. Approximately 33% of the scrap originated within the steel industry, 24% was derived from home markets, and the remaining 43% came from foreign countries. Iron and steel scrap was imported principally from France and West Germany.

Iron and steel scrap consumption and distribution, by source, for the last 2 years was as follows in thousand tons:

| | 1973 | 1974 |
|---|---|---|
| Source: | | |
| Own arising | 4,240 | 4,858 |
| Home supplies | 3,400 | 3,349 |
| Imports: | | |
| From ECSC countries | 3,755 | 4,836 |
| From other countries | 1,717 | 1,438 |
| Yearend stocks | 1,351 | 1,200 |

*Special Steels.*—Production of all types of special steels totaled 3.2 million tons in 1974 and was more than 18% lower than in 1973. The nation's output of carbon and alloy steel in the last 2 years was as follows in thousand tons:

| | 1973 | 1974 |
|---|---|---|
| High carbon steel: | | |
| Structural | 1,424 | 1,492 |
| Tool | 1 | 6 |
| Total | 1,425 | 1,498 |
| Alloy steel: | | |
| Structural | 2,073 | 1,290 |
| Tool | 18 | 16 |
| Bearing | 90 | 57 |
| Stainless | 297 | 322 |
| High speed | 2 | 2 |
| Others | 2 | 2 |
| Total | 2,482 | 1,689 |
| Grand total | 3,907 | 3,187 |

**Lead and Zinc.**—Output of lead concentrate decreased 3,546 tons in 1974 and was 14% lower than in 1973. Production of concentrate assaying 52% zinc metal approximated that produced in 1973. Low-grade zinc material assaying 7% metallic zinc declined 2% compared with 1973 figures. Declining output of these metals was apparently due to increased labor costs, decreasing grade of ore mined, and removal of protective tariffs. The province of Cagliari, Sardinia, was the source of virtually all lead and zinc ore mined in Italy.

Italy imports about 75% of its lead requirements and in 1974 three countries supplied most of the shipments. However, domestic production of zinc accounted for about 87% of the Nation's demand. Imports from Canada, Mexico, and Peru supplied most of the remainder.

**Magnesium.**—La Compagnia Generale del Magnesio S.p.A. (COGEMA) completed construction of a magnesium extraction plant near Melilli, Sicily. The capacity of the facility was reported at 60,000 tons per year. The magnesium, obtained from sea water, will be utilized in the manufacture of refractories and for other chemical products.

**Manganese.**—Italy was the only country within the EC to mine manganese ore exceeding 20% in grade. Output, however, dropped to 14,008 tons in 1974 from 25,529 tons mined in 1973. Manganese ore was mined at the Gambatesa facility near Varese Ligure. In 1974, the Nation imported 308,072 tons of manganese compared with 282,057 tons in 1973. The Republic of South Africa, Gabon, and Brazil supplied most of imports. An extensive exploration program in the vicinity of the Gambatesa mine over the past few years failed to increase manganese reserves.

**Mercury.**—Production of mercury metal declined by 6,759 flasks in 1974 and was nearly 21% lower than that in 1973. A decline in the world price and demand affected production rates at the nation's mercury mines. The average content of

the ore was 47% mercury, the same as that mined in 1973.

Despite lower output, Italy ranked second to Spain among world producers of mercury. Early in the year, EGAM obtained ownership of the mercury-producing mines and plants operated by Società Monte Amiata S.p.A. and Stabilimenta Mineraria del Siele S.p.A. For the past several years, production costs reportedly exceeded income from mercury sales at the two facilities necessitating a change in operating structure within the industry.

A decline in ore reserves and increasingly higher labor costs have made Italian mercury production uncompetitive on world markets. To arrest increasing unemployment in the area, the Italian Government was expected to continue operation of the mines and processing facilities of both companies. The 1974 employment at five operations totaled 1,013 workers. The Bagnore and Mt. Labbro mines were closed early in 1975 and were expected to remain on maintenance and/or development status during most of the year.

Italian exports of mercury decreased by 1,200 flasks, 17% lower than that of 1973. West Germany and India remained the leading importing countries At yearend, mercury stocks totaled about 105,000 flasks, or equivalent to about 3 years of production at the 1973 rate.

**Titanium.**—In February, Montedison was permitted by authorities of the Port of Livorno to resume ocean dumping of effluent from its Scarlino sulfate-process pigment plant for a 6-month trial period. The company also continued construction of a 30,000-ton-per year chloride-process plant at Cretone.

**Uranium.**—Azienda Generale Italiani Petroli S.p.A. (AGIP) plans to develop the Novazza uranium deposit near Valgoglio. Land was purchased and construction of a mining and milling facility having a capacity of approximately 250,000 pounds of uranium oxide annually was underway. Total minable uranium ore reserves were estimated in excess of 3.1 million pounds of recoverable uranium oxide.

A new deposit of uranium ore was reportedly discovered in the Lazio region containing an estimated 10,000 tons of uranium oxide. Development of the deposit was scheduled in the early 1980's.

To meet increasing demand for uranium oxide, AGIP negotiated numerous joint venture uranium exploration investments in four countries, namely the United States, Australia, Canada, and Nigeria. A joint venture exploration project in Nigeria resulted in discovery of a large uranium deposit containing an estimated 40,000 tons of recovered uranium oxide. The deposit was being developed by the Somair Mining Co.

The projected increase in future requirements for nuclear fuel has led the Comitato Nazionale per l'Energie Nucleare (CNEN) to resume uranium exploration. However, CNEN was expected to transfer the responsibility for uranium exploration to ENI during the year.

## NONMETALS

**Asbestos.**—Output of asbestos approximated that produced in 1973. Most of Italy's asbestos came from the San Vittore open pit mine operated by Società Amiantifera di Balangero S.p.A. near Turin. Italy exported 66,784 tons of short fiber asbestos and asbestos powder. West Germany and France received over 65% of total exports. Other countries receiving Italian asbestos were Libya, the Netherlands, Poland, and Spain. The Nation also is a large importer of asbestos. The Republic of South Africa and Canada accounted for over 80% of the import shipments.

**Barite.**—Output of ground barite increased by 12,040 tons in 1974 and was over 7% higher than in 1973. An increase in exports and domestic requirements by the chemical industry accounted for the higher output. Italy exported 17,370 tons in 1974 compared with 6,670 tons shipped in 1973.

**Cement.**—Cement output totaled 36.3 million tons, a slight decline from that of 1973. Reduced demand for cement in commercial and industrial construction was reflected in the lower production for 1974. Italy's cement industry continued to rank second to West Germany among West European countries. The industry comprises 120 plants, of which one-half are in northern Italy.

Cementerie Calabro Lucane S.p.A. commenced operations at its modernized plant near Castrovillari. Expenditures totaling nearly $1 million were for automated control system, portable crushing plants, and conveyor equipment. Limestone rock is

mined and crushed at two quarries and delivered to the cement plant by way of a conveyor system for a distance of over 6 miles. Vionini S.p.A. authorized expenditures of $8.5 million for a cement plant near Gonisa. A work force of 380 persons would be employed to produce 1 million tons of cement annually.

**Clays.**—*Bentonite.*—Production of bentonite totaled 344,604 tons, or 11% higher than that of 1973. Società Mineraria Isole Pontine S.p.A. (SAMIP) continued exploration and development of a large bentonite deposit estimated at 10 million tons near Isili, Sardinia. Italy exported 22,503 tons of bentonite, most was shipped to Libya.

**Feldspar.**—Output of feldspar increased significantly. Higher production was due to increased demand for the material by the ceramic industry and for export markets. The Giustino mine operated by Società Maffai Feldspato S.p.A. remained the largest producer of feldspar during 1974. Società Esercizo Cave Feldspato S.p.A. mined feldspar from the Tremenico pegmatite deposite south of Legnone. Italy exported about 14% of its output in 1974 compared with 17% in 1973.

**Fluorspar.**—Output of fluorspar increased by 13,843 tons and was 6% higher than in 1973. Italy's fluorspar industry was dominated by two companies, namely Montedison and Società Mineraria Silius S.p.A. The fluorspar mines in Sardinia accounted for more than 60% of the Nation's output, although mines in northern Italy near Trento also were important producers.

The nation's fluorspar industry is dependent on foreign markets for about 30% of its sales. The United States and West Germany were the destinations of most of the 1974 exports.

Ente Mineraria Sarda (EMS) continued a 3-year exploration program costing $2 million on a large concession in the Sarrabus-Sorrei and Sarcidano areas. The newly constructed fluorspar facility of Mineraria Silius near Assemeni, Sardinia, completed its first full year of operation. The rise in the Nation's fluorspar output was apparently due to additional production at the Assemeni plant.

**Phosphates.**—Fosfitalia S.p.A. continued construction of a plant to produce phosphoric acid and a range of phosphate compounds at Monfalcone, near Trieste. The facility, costing $5 million, will have a designed capacity of 250,000 tons annually. Sulfuric acid production for captive use will be included as part of the overall project.

Italy depends heavily on importation of phosphates for its requirements. In 1974 imports totaled nearly 2 million tons, of which Morocco accounted for about 50% of the shipments.

**Potassium Salts.**—Production of potassium salts totaled over 2.0 million tons, 14% higher than in 1973. Output came from mines operated by Montedison and AMMI near Palo, Racalmuto, Pasquasia, and Corvillo, Sicily. Montedison also operated a processing facility near Campofranco, Sicily. Virtually all the potassium ore production was processed into chemical fertilizers. The increase in output was attributed to higher worldwide prices and an increase in demand for potash fertilizers, especially in the export market. Expenditures for expansion of existing mining and processing facilities in Sicily were authorized by EGAM. Also, the Government agency reportedly developed a process to recover carnallite as a byproduct in the production of magnesium.

**Pyrite.**—Italy produced almost 1.2 million tons of pyrite ore in 1974, or approximately the same as in 1973. The Boccheggiano mine in Tuscany Province operated by EGAM was scheduled to close at year-end because of exhaustion of ore reserves.

Montedison's Scarlino plant continued processing pyrite concentrate to iron pellets and sulfur. Pollution problems had caused a decline in production in 1973, but installation of new equipment and a change in processing technology returned operations to normal.

Italy continued to rank second to Spain among Western European countries in the production of pyrite. Although output was over a million tons, the nation imported 222,779 tons compared with 300,837 tons in 1973. The U.S.S.R. was the principal supplier of pyrite.

EGAM authorized over $30 million to develop a large pyrite deposit in the Campiano area, Tuscany Province. The deposit contains an estimated 30 million tons of pyrite at a depth ranging from 1,500 to 3,000 feet. An 18-foot-wide tunnel will be driven into the deposit and the ore will be truck hauled to the surface plant. The mine will produce at an annual rate in excess of 1 million tons of pyrite

from which 500,000 tons of iron pellets and 1 million tons of sulfuric acid will be manufactured.

**Salt.**—The 1974 output of rock salt totaled over 4 million tons, an increase of 8% compared with that of 1973. Sicilian plants produced about one-third of the Nation's output. The increase in production was reportedly due to growing requirements of the chemical industry. About 71,000 tons was exported to Western European countries, principally to Portugal.

Società Industria del Salgemma S.p.A. planned to spend $10.5 million on expansion of its rock salt processing and mining facility near Petralia, Sicily. At completion of the project, employment was expected to increase to 650 workers from the 430 currently employed.

**Stone.**—*Marble.*—Production of block marble (white and colored) increased by 26,000 tons in 1974 and was more than 2% higher than that of 1973. An increase in Italy's building construction and higher exports accounted for the rise in marble output.

More than 80 types and/or grades of marble was produced in Italy, mostly from Tuscany, but also included numerous other varieties of metamorphic rock quarried in many parts of the country.

Exports of marble in blocks, slabs, and finished pieces rose more than 7% compared with that of 1973.

EGAM purchased a significant marble mining concession in the Alpine area from Montedison. Marmifera Irpina S.p.A. commenced operations of a marble processing plant costing $1.7 million near Polito Ultra. Estraba S.p.A. exported $370,000 worth of Roman travertine marble for building facades and interior purposes to the United States.

**Sulfur.**—Output of sulfur ores declined significantly from that produced in 1973. Most of the sulfur production came from the strip mining project near Pomezia. Sulfur ore also was mined at 12 small mines in Sicily.

Despite lower output, Sicily's mine production costs remain high, hence prices are not competitive with those of foreign sulfur. For example, sulfur produced in Sicily costs about $120 per ton compared with an international price of $52 per ton. The average grade of sulfur ore was 21% compared with 22% for ore mined in 1973.

Imports of sulfur increased to 765,304 tons from the 408,066 tons received in 1973. Two countries, Canada and Poland, supplied about 80% of the imports.

The decision to close 7 of 12 mines in Sicily was postponed by Ente Minerario Siciliano (EMS) because of depressed economic conditions in the Nation.

## MINERAL FUELS

Consumption of fuels in Italy was estimated at 120.8 million tons of crude oil equivalent.[3] Since the output of coal, crude oil, and natural gas remains small, imports of solid and liquid fuels were a significant part of the Nation's energy supply. Domestic resources provided an estimated 19% of the energy consumed while the remainder came from imports. Table 5 shows the share of different sources of energy in tons of crude oil equivalent.

**Coal.**—Coal output at the Seruci mine in Sardinia dropped to 3,681 tons or 26% below 1973 figures. However, because of sharp increases in crude oil costs, the Government was studying the feasibility of reopening the sulcis coal mines.

Italy's coal deposits, in the Sulcis Basin of Sardinia, are very low in thermal quality and high in sulfur and ash content. Because of these deleterious elements, the use of sulcis coal hinders the operation of electric power producing complexes and adds to operating costs. In the early 1950's, the coal mining industry provided employment for nearly 9,000 workers. The 1974 employment was reported at about 500 maintenance workers.

Coal continued to rank high on the list of Italian imports of mineral commodities. In 1974, nearly 12 million tons of coal was imported of which 25% came from the United States. Coking coal accounted for about 95% of coal imports, the remaining 5% was steam coal, anthracite, gas coal, and other solid fuels. Italy's imports from Australia were expected to increase substantially in the future because of long-range supply contracts.

EFIM invested $86 million in a joint venture with the South Cape Corp. of South Africa to develop and operate two coal mines near Ellisras and Davel, Republic of South Africa. EFIM will construct a pipeline and a terminal at Richards Bay on the Natal Coast, Republic of South Africa, the former for transportation purposes and the latter to load coal onto ocean-going boats for shipment to Italy.

[3] At 10,000 calories per kilogram.

**Table 5.—Consumption of solid and liquid fuels, natural gas, and electric power**
(Quantity in thousand metric tons of crude oil equivalent, at 10,000 callories per kilo)

| Year | Coal and lignite | | Crude oil | | Natural gas | | Electric power | | Total [1] | | From domestic sources | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quantity | Index | Quantity | Index | Quantity | Index | Quantity | Index | Quantity | Index | Quantity | Index |
| 1955 | 8,344 | 91 | 9,824 | 21 | 2,974 | 43 | 7,617 | 63 | 28,759 | 38 | 11,506 | 57 |
| 1956 | 8,827 | 96 | 11,587 | 25 | 3,661 | 53 | 7,762 | 64 | 31,837 | 42 | 12,581 | 62 |
| 1957 | 9,078 | 99 | 12,415 | 26 | 4,090 | 59 | 7,954 | 66 | 33,537 | 45 | 13,658 | 68 |
| 1958 | 7,943 | 87 | 13,823 | 29 | 4,244 | 61 | 8,862 | 74 | 34,872 | 46 | 15,000 | 74 |
| 1959 | 7,402 | 81 | 15,713 | 33 | 5,016 | 73 | 9,479 | 79 | 37,610 | 50 | 16,300 | 81 |
| 1960 | 8,028 | 87 | 19,324 | 41 | 5,286 | 76 | 11,208 | 93 | 43,846 | 58 | 18,279 | 90 |
| 1961 | 8,557 | 93 | 23,010 | 49 | 5,627 | 81 | 10,360 | 86 | 47,554 | 63 | 18,063 | 89 |
| 1962 | 9,062 | 99 | 28,572 | 61 | 5,862 | 85 | 9,995 | 83 | 53,491 | 71 | 17,667 | 87 |
| 1963 | 9,032 | 98 | 33,273 | 71 | 5,959 | 86 | 11,692 | 97 | 59,956 | 80 | 18,888 | 93 |
| 1964 | 8,318 | 91 | 38,635 | 82 | 6,301 | 91 | 10,550 | 88 | 63,804 | 85 | 19,013 | 94 |
| 1965 | 8,606 | 94 | 42,166 | 90 | 6,397 | 93 | 11,521 | 96 | 68,690 | 91 | 19,770 | 98 |
| 1966 | 9,180 | 100 | 46,943 | 100 | 6,915 | 100 | 12,041 | 100 | 75,079 | 100 | 20,198 | 100 |
| 1967 | 9,624 | 105 | 52,135 | 111 | 7,562 | 109 | 11,800 | 98 | 81,121 | 108 | 20,672 | 102 |
| 1968 | 9,473 | 103 | 58,321 | 124 | 8,819 | 128 | 11,856 | 98 | 88,469 | 118 | 21,782 | 108 |
| 1969 | 9,601 | 105 | 64,368 | 137 | 9,800 | 142 | 11,497 | 95 | 95,266 | 127 | 22,582 | 112 |
| 1970 | 9,446 | 103 | 73,687 | 157 | 10,694 | 155 | 12,024 | 100 | 105,851 | 141 | 22,973 | 114 |
| 1971 | 9,094 | 99 | 77,508 | 165 | 10,892 | 158 | 11,212 | 93 | 108,706 | 145 | 22,672 | 112 |
| 1972 | 9,600 | 104 | 93,500 | 199 | 12,500 | 181 | 10,800 | 90 | 126,400 | 168 | 22,812 | 113 |
| 1973 | 8,800 | 95 | 85,500 | 182 | 14,200 | 206 | 10,700 | 89 | 119,200 | 158 | 23,115 | 115 |
| 1974 | 10,100 | 109 | 83,507 | 178 | 15,900 | 231 | 11,407 | 95 | 120,914 | 160 | 23,447 | 117 |

[1] Bunkers not included.

Source: Italian Ministry of Industry and Commerce.

*Lignite.*—Lignite mining was related to activity at the pithead thermoelectric plants in the principal domestic lignite coalfields of Valdarno and Pietrafitta. Output of lignite decreased 9% from that produced in 1973. Reserves at known lignite deposits in Italy were reportedly estimated at 40 million tons.

The Mecure mine in the Province of Potenza was shutdown in 1973 because the lignite deposit in the area was exhausted. Electric power production continued to increase at plants utilizing fuel oil.

**Coke.**—The 1974 output of coke increased to 8.6 million tons from 7.7 million tons produced in 1973. Metallurgical coke accounted for all of the output. Italy's entire output of coke was produced from imported coking coal, principally from the United States, West Germany, the U.S.S.R., and Poland.

**Electric Energy.**—Production of electricity continued to increase in 1974 with thermal plants supplying more than 70% of total production. Ente Nazional Energia Electrica (ENEL) plans to increase domestic electrical generating capacity by 23.6 megawatts by 1980, of which new thermoelectric plants would supply 12.8 megawatts; hydroelectric plants, 5.0 megawatts; nuclear plants, 4.9 megawatts; and gas turbine generating plants, the remainder.

Construction was initiated on a thermoelectric power facility at Torvaldaliga by ENEL. The plant will consist of four generators, each producing 3.5 megawatts of electricity.

**Nuclear Energy.**—ENEL planned large expenditures in nuclear powerplant construction to meet future energy requirements of the Nation. At yearend, three nuclear powerplants were in operation with an installed capacity of 577 megawatts. A fourth nuclear facility was under construction at Caorso. It will employ the enriched uranium-boiling water principle to generate 850 megawatts of electricity. Completion was scheduled for the last quarter of 1975. Construction of a fifth nuclear facility employing a Cireno prototype reactor was scheduled to begin at midyear 1975. The plant, located near Latina, will be built by CNEN and ENEL. Completion of these two plants was expected to temporarily ameliorate the Nation's enery situation.

**Natural Gas.**—Production of natural gas in 1974 was nearly 15.3 billion cubic meters, approximately that recovered in 1973. Output came from the Po Valley gasfields, offshore Ravenna, Ferrara gasfields, and gasfields in southern Italy. Offshore gasfields accounted for about one-half of Italy's 1974 natural gas production.

Natural gas was reportedly discovered about 13 miles offshore from Rimini in the Adriatic Sea by a consortium of companies that include AGIP, Montedison, and Texaco. Two test wells were completed on the Anemone structure and drilling of another was underway at yearend. The wells were spaced over 1 mile apart.

The 1974 natural gas discoveries added an estimated 19.5 billion cubic meters (565,000 million cubic feet) to Italian gas reserves, exceeding the amount consumed in 1974. Domestic reserves are estimated to total 220 billion cubic meters compared with 213 billion reported in 1973.

At midyear, ENI announced new price schedules on natural gas consumed for industrial purposes. From the previous flat rate of 2.3 cents per cubic meter, the new price will range from 4.2 cents to 4.6 cents per cubic meter, depending on the amount consumed. The new price schedule was expected to return nearly $300 million annually to ENI. In the past year, the agency reported record deficits because of increased costs of imports. The substantial increase in earnings will allow ENI to conduct an intensive exploration and development program in Italy for new hydrocarbon resources.

At midyear, Exxon Libya Co. discontinued delivery of liquefied natural gas (LNG) from its Marsa el Brega plant in Libya to the regassification plant at Panagaglia because of a disagreement over delivery price with ENI. The Libyan Government increased taxes on exported natural gas and when passed on to ENI the price tripled. ENI declined to consider a price revision because the 1965 agreement did not provide for increase in price due to higher taxes. Operations at the regassification plant were discontinued thus depriving Italy of about 12% of its natural gas requirements.

Italy consumed about 19.7 billion cubic meters of natural gas in 1974. Consumption continued to exceed domestic production. Italy imported about 4.4 billion cubic meters of natural gas, principally from Libya LNG was regassified at the Società Nationale Metanodotti Progetti (SNAM) plant at Panagaglia and transferred to the Italian distribution system. At yearend, some natural gas was received via pipeline from the Groningen gasfield in the Netherlands and the Tyumen gasfield in Siberia. Industrial users accounted for 71% of the natural gas market. Other major consumers were residential and commercial establishments, 24%; electric power generating facilities, 4%; and other uses, 1% (table 6).

**Table 6.—Natural gas production and consumption**
(Thousand cubic meters)

| Year | Production | Consumption | | | | | |
|---|---|---|---|---|---|---|---|
| | | Industrial | Domestic and heating | Electric power generation | Trans-portation | Mining | Total |
| 1955 | 3,615,824 | 2,591,706 | 310,221 | 503,053 | 199,875 | 13,027 | 3,617,882 |
| 1956 | 4,465,429 | 3,119,189 | 433,699 | 671,618 | 219,510 | 19,004 | 4,463,020 |
| 1957 | 4,987,074 | 3,549,561 | 515,704 | 644,462 | 231,142 | 20,201 | 4,961,070 |
| 1958 | 5,175,670 | 3,973,693 | 624,983 | 304,011 | 234,151 | 23,973 | 5,160,811 |
| 1959 | 6,117,549 | 4,812,009 | 695,346 | 327,961 | 228,687 | 28,711 | 6,092,714 |
| 1960 | 6,447,224 | 5,170,598 | 819,090 | 204,704 | 214,617 | 25,510 | 6,434,519 |
| 1961 | 6,862,710 | 5,379,266 | 909,617 | 350,718 | 180,979 | 21,794 | 6,842,374 |
| 1962 | 7,150,580 | 5,299,763 | 1,163,212 | 495,088 | 152,374 | 17,899 | 7,128,336 |
| 1963 | 7,267,598 | 5,338,620 | 1,336,089 | 424,372 | 130,645 | 15,402 | 7,245,128 |
| 1964 | 7,684,300 | 5,420,195 | 1,536,805 | 514,612 | 117,218 | 15,506 | 7,604,336 |
| 1965 | 7,802,445 | 5,423,447 | 1,741,115 | 434,980 | 111,680 | 16,762 | 7,727,984 |
| 1966 | 8,795,066 | 5,760,096 | 1,846,548 | 667,399 | 105,013 | 19,769 | 8,398,825 |
| 1967 | 9,366,902 | 6,245,215 | 2,022,670 | 771,511 | 101,909 | 24,138 | 9,165,443 |
| 1968 | 10,412,272 | 7,019,834 | 2,242,748 | 1,272,369 | 98,756 | 30,589 | 10,664,296 |
| 1969 | 11,959,241 | 7,842,208 | 2,609,651 | 1,234,241 | 98,497 | 34,596 | 11,819,193 |
| 1970 | 13,137,742 | 8,584,259 | 2,971,766 | 1,110,100 | 93,834 | 61,351 | 12,821,310 |
| 1971 | 13,389,548 | 9,231,655 | 3,431,121 | 266,260 | 109,973 | 71,794 | 13,110,803 |
| 1972 | 14,187,057 | 10,518,562 | 3,952,036 | 530,902 | 131,617 | 71,357 | 15.204,474 |
| 1973 | 15.327,057 | 11,575,669 | 3,961,635 | 609.482 | 137.215 | 70.575 | 16,354,576 |
| 1974 | 15,272,579 | 13,943,562 | 4,772,327 | 733,555 | 165,020 | 85,521 | 19,699,985 |

Source: Italian Ministry of Industry and Commerce.

**Petroleum.**—Domestic output of petroleum decreased 77,000 tons in 1974 and was 7% below that of 1973. The reduced output resulted from lower production rates at the Ragusa and Gela oilfields as well as the difficulty of marketing the output at the Gela refinery because of its high-sulfur content.

Production of crude oil has been declining since 1970 because of depletion of resources in the Ragusa and Gela oilfields, the principal source of Italy's petroleum output. However, discovery of crude oil in the Po Valley Basin was expected to arrest the Nation's declining production.

Petroleum product prices were increased on three occasions between September 1973 and July 1974, reflecting the rising cost of crude oil. The retail price of gasoline increased to 48 cents per liter, an increase of 85%. However, prices for gas oil and fuel oil increased less dramatically.

The Nation is heavily dependent on importation of crude oil. Imports in 1974 totaled 118.5 million tons, 8% lower than those of 1973. The Middle East countries supplied 82.8 million tons; African countries, 31.4 million tons; east Mediterranean countries, 11.8 million tons; the U.S.S.R., 3.6 million tons; and other countries, 0.7 million tons.

*Pipelines.*—At yearend, Italy's pipeline network totaled 10,991 kilometers, an increase of over 1% over that of 1973. More than 510 kilometers of pipeline were in process of construction during 1974.

On June 8, 1974, two pipelines linking the Groningen gasfield (the Netherlands) and the Tyumen gasfield (Siberia) with the Italian natural gas distribution system were officially placed into operation. In 1972, ENI contracted to purchase 6 billion cubic meters annually of natural gas from N.V. Nederlandse Aardolie Maatschappij, the Netherlands natural gas producer, and 6 billion cubic meters annually from the U.S.S.R. The length of the two pipelines totaled 1,590 kilometers, of which, 816 kilometers came from the Netherlands and 774 kilometers from the Czechoslovak border. Approximately 5,000 men, working for about 22 million hours over a 2-year period, were employed in construction of the pipelines. Total costs of the two pipeline projects was estimated at $786 million.

At yearend, a 16-kilometer section of a pipeline was completed in the Messina Straight between Calabria and Sicily. The section is part of a 2,414-kilometer pipeline under construction to deliver 11.7 billion cubic meters of natural gas over a 25-year period from the Hassi R'Mel gasfield in Algeria to Italy. Sales and construction agreements were negotiated last year between ENI and Société Nationale pour la Recherche, la Production, le Transport, la Transformation et la Commercialisation des Hydrocarbures (SONATRACH), an Algerian State Agency. Construction of the pipeline was an outstanding accomplishment for ENI engineers because of the development and successful application of new deep-water technology and a historical first at depths of over 300 meters of water.

Terminale GNL Monfalcone, S.p.A., a consortium of Italian, West German, Austrian, and Swiss natural gas distribution agencies, was formed to construct and operate a LNG regassification terminal near Trieste and a 442 kilometers pipeline distribution network. LNG will be obtained from Algeria and delivered to the terminal by liquid methane tankers thence regassified and transmitted by pipeline to Karlsruhe, West Germany, and other marketing areas in Austria, Southern Germany, and western Switzerland. The pipeline transmission capacity was reported at about 6 billion cubic meters annually. ENI will represent Italian interests in the venture.

*Refining.*—Oil throughput at Italian refineries decreased about 7%. The decrease was due to lower domestic demand and lower exports. Total crude runs to stills in refineries totaled 122.4 million tons compared with 131.7 in 1973. Petroleum products produced at refineries are tabulated in table 7. Domestic markets consumed about 74% of the processed crude oil. Consumption of petroleum products decreased 5% compared with 1973 figures. Fuel oil accounted for over 42% of total production, followed by motor oil, 24%; gasoline, 12%; and miscellaneous purposes, 22%.

Mobil Oil Italiana S.p.A. (MOI) acquired a 25% interest in the Bertonico refinery owned by Sarni S.p.A. The $30 million investment in refining capacity will provide MOI with petroleum products for the company's northern Italian marketing area. Previously, MOI had obtained petroleum products from the Gulf Italiana S.p.A. refinery under a long-range products exchange agreement.

At yearend 1974, there were 36 refineries

in operation with a total installed annual capacity of 200 million tons (table 8). The Nation's petroleum industry was operating at 61% of its theoretical capacity. Expansion projects underway and/or authorized were expected to increase capacity to 250 million tons by 1980. Italy ranked first among the nations in the EC and third in the world in crude oil refinery capacity. The current refinery capacity exceeds the Nation's domestic consumption of petroleum products by a factor of two.

**Table 7.—Petroleum refinery production**
(Metric tons)

| Year | Crude oil and residues processed | Main products obtained | | | | | |
|---|---|---|---|---|---|---|---|
| | | Gasoline | Jet fuel | Kerosine | Gas oil | Fuel oil | Lubricating oils |
| 1955 | 17,533,300 | 2,718,270 | 589,682 | 524,591 | 3,586,282 | 7,774,035 | 147,934 |
| 1956 | 19,286,300 | 3,098,225 | 569,781 | 565,301 | 3,944,376 | 8,508,101 | 167,547 |
| 1957 | 20,718,100 | 3,080,952 | 505,249 | 530,036 | 4,354,594 | 9,621,411 | 149,544 |
| 1958 | 24,105,808 | 3,453,000 | 716,218 | 477,572 | 4,670,163 | 11,899,545 | 154,057 |
| 1959 | 26,409,374 | 3,969,881 | 580,748 | 446,667 | 5,189,457 | 13,133,734 | 153,378 |
| 1960 | 30,866,574 | 5,026,855 | 529,283 | 531,191 | 5,944,253 | 15,346,428 | 165,792 |
| 1961 | 35,057,868 | 5,517,756 | 688,730 | 689,872 | 6,376,872 | 17,787,951 | 155,415 |
| 1962 | 41,825,062 | 6,582,370 | 649,924 | 722,495 | 7,607,587 | 21,609,423 | 172,567 |
| 1963 | 48,350,127 | 7,212,794 | 710,923 | 817,462 | 8,952,718 | 25,178,408 | 169,129 |
| 1964 | 57,851,398 | 8,511,734 | 794,441 | 828,723 | 10,334,375 | 30,587,238 | 259,170 |
| 1965 | 69,368,370 | 10,304,062 | 1,005,600 | 1,333,648 | 12,303,365 | 36,684,295 | 347,563 |
| 1966 | 80,615,660 | 12,213,671 | 1,435,311 | 1,490,478 | 14,248,262 | 42,298,809 | 442,627 |
| 1967 | 87,110,826 | 15,054,405 | 1,249,018 | 2,226,010 | 15,960,871 | 43,253,351 | 444,529 |
| 1968 | 94,892,875 | 17,872,617 | 1,704,304 | 2,559,159 | 17,657,424 | 45,086,791 | 495,499 |
| 1969 | 105,557,200 | 19,490,980 | 1,556,337 | 3,299,460 | 19,886,397 | 49,571,410 | 524,771 |
| 1970 | 117,235,907 | 21,440,553 | 1,486,326 | 4,348,155 | 23,015,860 | 54,203,860 | 534,571 |
| 1971 | 120,280,771 | 21,785,373 | 1,849,895 | 4,140,643 | 23,739,216 | 53,949,947 | 545,447 |
| 1972 | 124,359,764 | 22,709,148 | 2,072,148 | 4,141,447 | 25,189,539 | 55,401,000 | 497,190 |
| 1973 | r131,680,000 | r15,096,000 | 2,168,400 | 4,331,600 | r28,782,000 | r57,398,000 | 495,000 |
| 1974 | 122,423,624 | 14,701,068 | 1,798,483 | 3,964,756 | 29,100,000 | 51,208,158 | 646,244 |

r Revised.

Source: Italian Central Institute of Statistics (ISTAT).

**Table 8.—Petroleum refineries and integrated chemical plants**
(Thousand metric tons)

| Refinery | Location | Throughput |
|---|---|---|
| Amoco | Cremona | 2,680 |
| ANIC | Sannazzaro | 4,634 |
| API | Falconara (Ancona) | 2,829 |
| Aquila | Trieste | 2,276 |
| BP | Volpiano (Turin) | 2,011 |
| Garrone | Genoa | 6,528 |
| Gaeta Industrie Petroli | Gaeta | 2,162 |
| Gulf | Bertonico (Milan) | 3,394 |
| Icip | Mantua | 1,748 |
| Ilsea | Valmadrera (Como) | 176 |
| Irom | Porto Marghera (Venice) | 3,331 |
| Lombarda Petroli | Villasanta | 1,113 |
| Mediterranea | Milazzo (Messina) | 8,531 |
| Mobil Oil | Napoli (Naples) | 4,939 |
| Raffineria di Roma | Pantano (Roma) | 3,049 |
| Rasion | Augusta (Siracusa) | 7,455 |
| Sanquirico | Genoa | 707 |
| Saras | Gagliari | 11,908 |
| Sarom | Ravenna | 3,672 |
| Sarpom | Trecate | 7,485 |
| Shell | La Spezia | 3,616 |
| Do | Rho (Milano) | 3,117 |
| Do | Toranto | 3,479 |
| S.P.I | Arcola (La Spezia) | 813 |
| Stanic | Bari | 2,056 |
| Do | Livorno | 3,807 |
| Other Refineries | | 2,146 |
| Total refineries | | 99,657 |
| Integrated chemical plants: | | |
| Anic | Gela (Caltanissetta) | 4,243 |
| Montedison | Brindisi | 2,163 |
| Do | Priolo Melilli | 14,177 |
| Total plants | | 20,583 |
| Unfinished | | 2,184 |
| Grand total | | 122,424 |

Construction was continued on two refinery complexes with a combined annual capacity of 22 million tons, one at Porto Gruaro, and the other at Melilli. The Porto Gruaro facility, jointly owned by Azienda Nazionale Idrogenazione Combustibili (ANIC) and ENI, will be supplied with crude oil by pipeline from Triest and the finish product returned to the area via another pipeline for marketing purposes. When completed, the Melilli facility, jointly owned by a group of private investors and ENI, will be Italy's largest refinery. About 80% of its output was scheduled for export markets, principally the United States.

*Exploration.*—Exploration for hydrocarbons was intensified in Italy during 1974. The major part of this exploratory activity was in offshore areas where numerous geophysical anomalies remain untested.

Deep exploratory drilling in onshore areas discovered hydrocarbon liquids and gas in the pre-Alpine zone in the Po Valley Basin.

ENI discovered the Molassa oilfield and gasfield near Bergamo, Northern Italy, in the Po Valley Basin. The discovery well, Molossa No. 1, tested 1,800 barrels of oil and 16 million cubic feet of natural gas per day through a 3/8-inch choke. The well was drilled to a depth of 5,300 meters into a pay zone consisting of limestone and dolomite estimated to be over 600 meters thick. The oil, analyzed 35° API and contained very little sulfur. A separation plant was under construction at midyear. The plant will produce 2.5 million tons of oil and 3 billion cubic meters of natural gas annually. At yearend, three producing wells were drilled into the oilfield and gasfield and drilling of two additional wells was underway. The Molossa oilfield and gasfield was the largest discovery of hydrocarbons on record in Italy. The field is situated in a highly industrialized area and in proximity to refineries. Geological evaluation of the discovery and test well indicated a potential hydrocarbon reserve containing 40 million tons of petroleum and 50 million cubic meters of natural gas. Anticipated natural gas production was expected to equal that imported from Libya.

The Po Valley Basin is underlain by geological strata and structure favorable for oil and gas resources. Intensive exploratory drilling now in progress was expected to result in discovery and production of sufficient hydrocarbons to meet most of Italy's requirements in the future. These favorable structural and stratigraphic anomalies were defined by a geophysical survey conducted over the area for the past 2 years. ENI was test drilling an extension of the structure near Turbigo, west of Milan.

**Table 9.—Concessions and exploration permits for oil and natural gas**
(Hectares)

| Area | 1973 | 1974 |
|---|---|---|
| Mainland: | | |
| Exploration permits | 2,095,155 | 2,044,034 |
| Concessions | 200,041 | 197,572 |
| Total | 2,295,196 | 2,241,606 |
| Offshore: | | |
| Exploration permits | 5,912,207 | 5,429,588 |
| Concessions | 52,876 | 101,836 |
| Total | 5,965,083 | 5,531,424 |
| Grand total | 8,260,279 | 7,773,030 |

Source: Italian Ministry of Industry and Commerce.

A consortium of foreign and Italian exploration companies namely ENI, British Petroleum Italiana S.p.A., and Elf Aquitane Oil Co., reportedly discovered oil in the Adriatic Sea about 24 kilometers from the port city of Vasto. Two holes drilled in 80 meters of water showed good quality oil. Further test drilling and geological studies were underway to assess the significance of the discovery and its commercial potential.

Elf Italiana S.p.A., a French-Italian joint venture, discovered oil in a well drilled at Fermo, near Ancona. A second well was drilled to confirm the oilfield discovery. The crude oil was analyzed to contain high sulfur and approximately 17° to 21° API. Yield of the oilfield was estimated at 2.5 million tons per year.

# The Mineral Industry of Japan

By K. P. Wang [1]

The Japanese claim that during the first full year (fiscal 1974)[2] since the shift from cheap and abundant oil to an expensive and limited supply, the Japanese economic slowdown has been excessive, recording a minus growth rate; unemployment and bankruptcies have been rampant; and consumer buying power has dwindled under the influence of extremely high inflation.[3] The country's oil and gas import bill had increased from less than $7 billion in 1973 to nearly $22 billion in 1974. The end of the economic downturn was not yet in sight at yearend.

Japan's 1974 gross national product (GNP) was estimated at about Y131.7 trillion.[4] At current yen prices, the growth rate was 18.6%; this compares with 26% in 1973 and generally 10% to 15% during 1966–71. In terms of constant 1970 prices, the annual GNP increase in yen value was closer to 9% for 1972, 10% for 1973, and minus 1.7% for 1974. In the first quarter of 1975 which corresponds to the last quarter of fiscal 1974, industrial output was drastically cut and numerous expansion plans were curtailed or delayed. The yen rallied in the spring but moved back up to about Y300=US$1.00 for the rest of 1974.

Japan's mineral industries, based predominantly and increasingly upon the processing of imported raw materials and domestic and foreign secondary materials, were severely affected in 1974 by the oil crisis and ensuing worldwide recession. Most industries moved back expansion plans, moved ahead furnace and equipment repair schedules, shutdown the least efficient facilities either temporarily or permanently, negotiated for reduced ore deliveries and the least amount of price increases, and had to deal with slumping sales, excessive inventories, and labor difficulties. The degree of disruption varied with individual mineral industries. The financially strong steel industry stood up well under the economic strain, although much surplus capacity could not be utilized. Increased foreign demand for steel products compensated for slumping domestic sales. Imported coal and iron ore prices soared, but prices for finished steel also rose significantly. The copper industry was hard hit by a rising inflow of ore supplies coupled with cutbacks in operations and a drastic reduction in demand for copper products. At the same time copper prices declined sharply during the year. The lead-zinc industries owned mainly by the same firms that produce copper suffered nearly the same fate. The aluminum industry had problems of similar magnitude but was less vulnerable because of its many international ties. Domestic construction was down, saved somewhat by a public works program. Generally, the metal industries produced close to the 1973 levels but with more idle capacity, whereas production in the cement industry declined moderately. The petroleum refining industry continued to expand, although the quantity processed was slightly reduced. The high petroleum prices did not greatly affect refining operations. Oddly, the Japanese market was flooded with surplus byproduct elemental sulfur recovered from oil refining. Japanese fertilizers were still in great demand, but costs and prices were much higher than usual. Production in the domestic coal industry continued to decline, with imported coal taking up the slack. Nuclear powerplants encountered severe difficulties during 1974.

During 1974, the Ministry of International Trade and Industry (MITI) looked

[1] Supervisory physical scientist, Division of Nonmetallic Minerals.

[2] The Japanese fiscal year is from April to March.

[3] Focus Japan (Tokyo). An Economic Outlook: What Now? V. 2, No. 3, March 1975, pp. 2–4.

[4] Weighted average exchange rate for 1974 of Japan Yen (Y) was about Y291.7=US$1.00.

into the matter of raw material stockpiling.[5] On the advice of a study committee on the stockpiling of nonferrous metals, MITI requested for fiscal year 1975 budgetary appropriations totaling Y44,100 million (about $147 million) to begin stockpiling emergency supplies of copper, nickel, chromium, and tungsten. Other nonferrous metals to be studied in the future were zinc, cobalt, molybdenum, antimony, and tin. A MITI-controlled Japan Metal Mining Public Corporation would be formed to supervise stockpiling arrangements and issue bonds. MITI was also seeking a commitment from the Japan Export-Import Bank to make available Y70,000 million (about $233 million) at 7.5% interest which private companies may borrow to finance up to 70% of the cost of ore imported to produce primary metals for the stockpiling project. MITI further requested a small budget (about $420,000) to establish subcommittees to study iron ore, copper, bauxite, chromium, tin, and coking coal.

On December 4, the Foreign Ministry established an International Resources Problems Research Council to investigate energy and Middle East oil. The Japanese were moving ahead on their program to build up facilities to store a 90-day supply of liquid fuels. Oil stockpiling had taken priority over metal stockpiling for the time being, for lack of adequate funds and the fact that the nonferrous metal industries had accummulated very large inventories because of the recession. The Government had no money to buy these surpluses for stockpiling, but gave the copper industry about $100 million for "relief" instead. In October 1974, a public corporation controlled by the Forestry Agency began with a $1 million budget to stockpile plywood and lumber.

The long-standing Japanese Government program to encourage mineral exploration at home and abroad is evidenced by the activities of the Metal Mining Agency of Japan.[6] In 1974, three measures were taken to expand the Agency's overseas exploration activities: (1) Increase overall exploration funds abroad; (2) provide subsidies to Japanese mining companies to facilitate international joint projects; and (3) increase government subsidies for detailed geological exploration projects from 60% to 66.6%. The Agency has a Mineral Resources Center to maintain mineral surveillance abroad and dispatch survey missions. It has a program to make basic geological surveys and promote mineral resources development in developing countries. A special financing system was introduced for uranium and other minerals in foreign countries on a "repay if successful" basis. A "geological survey vessel" was completed in late 1974 for exploring offshore and deep-sea mineral deposits. The Agency's activities have recently been broadened to cover prevention of pollution. Agencies like the Japan Export-Import Bank and the Overseas Economic Cooperation Fund continued to finance many kinds of mineral projects, including mining, beneficiation, smelting, refining, and mineral transport. Not to be overlooked are the Agency's domestic activities like regional geological surveys, detailed exploration, and revolving funds for exploration in Japan. The Government continued to work closely both at home and abroad with private Japanese mining companies, who constitute the backbone of the total effort to secure and process mineral raw materials worldwide. The Metal Mining Agency had eight regional offices abroad as of year-end 1974.

Japan's 1975 energy conservation program was aimed at cutting oil imports by about 3%, following a 2.6% active cut in oil consumption during 1974 over that in 1973. The goal was to economize on the use of oil and electricity without seriously hampering industrial activities. The industrial sector will be subjected to an energy control campaign; the Government sector will aim at a 13% reduction in energy use; and the nonindustrial sector will be urged to save 10%. Japan's industries were seriously investigating and introducing energy-saving processes and equipment, closing down or writing off less efficient mines and plants in the process. The Government was also focusing on energy and resource problems through the establishment of a totally new Resources and Energy Agency under MITI.

Early in 1975, the Industrial Technology Council, an advisory body to MITI, called for a series of urgent measures to cope with future energy problems. A recommended

[5] U.S. Embassy, Tokyo, Japan. State Department Airgram A-750, Dec. 26, 1974, pp. 1-12.
[6] Metal Mining Agency of Japan (Tokyo). Report for 1974. Pp. 1-27.

energy-saving program would cover (1) more efficient use of heat energy by industry; (2) greater efficiency in manufacturing processes; (3) greater use of waste heat; (4) recycling of scrap (for example, scrap aluminum can be recycled at some 4% of the energy required for new production); and (5) greater systemization of energy use in general such as regional heating and cooling and nuclear-powered total energy systems for industrial complexes.

## PRODUCTION

Japan's mineral and metal production showed slight increases in aluminum and copper, little change in lead and zinc, slight declines in steel and refined oil, and moderate decreases in cement and coal. Having achieved substantial industrial gains in the last decade, Japan's days of continued sharp growth in mineral and metal output have apparently come to a temporary halt, primarily as a result of the energy crisis.

During the last few months of 1974, industrial production declined sharply across the board, on account of overall sluggish domestic and foreign demand for Japan's mineral and metal products. Cutbacks in steel, cement, and oil refining were moderate; however, the gap between capacity and production widened as additional facilities continued to come onstream. In contrast, cutbacks in nonferrous metals were rather severe, with contemplated reductions of up to 40% during the first half of 1975. These adverse developments were not different from elsewhere, except temporary setbacks by Japan's custom-smelting type of mineral industries were more severe than those by other countries with mineral economies more dependent upon indigenous raw materials.

Despite these trends, Japan held its own as a prominent world producer of mineral products. Its 1974 rankings for certain major minerals were as follows: Pyrite and slab zinc (1st); chemical fertilizers (2d); cement, refined copper, steel, aluminum, and refined oil (3d); coke (4th); and refined lead (5th).

**Table 1.—Japan: Production of mineral commodities**
(Thousand metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| METALS | | | | |
| Aluminum: | | | | |
| Alumina, gross weight | | 1,644 | 1,987 | 1,801 |
| Metal: | | | | |
| Primary: | | | | |
| Regular grades | | 1,009 | 1,097 | 1,118 |
| High purity | | 6 | 6 | 6 |
| Total | | 1,015 | 1,103 | 1,124 |
| Secondary | | 412 | 536 | 517 |
| Antimony: | | | | |
| Mine output, metal content | tons | (1) | (1) | -- |
| Oxide | do | 3,639 | 4,492 | 4,418 |
| Metal | do | r 3,197 | 2,783 | 2,166 |
| Arsenic, white (equivalent of arsenic acid) | do | 427 | e 450 | 193 |
| Bismuth | do | 895 | 855 | 794 |
| Cadmium | do | 3,029 | 3,160 | 3,077 |
| Chromium: | | | | |
| Chromite, gross weight | do | 24,819 | 23,174 | 25,858 |
| Metal | do | r 2,392 | 2,001 | 2,146 |
| Cobalt metal | do | -- | -- | 10 |
| Columbium and tantalum, tantalum metal | do | 19 | 43 | 52 |
| Copper: | | | | |
| Mine output, metal content | | r 138 | 91 | 82 |
| Metal: | | | | |
| Blister | | 778 | 1,001 | 1,009 |
| Refined | | 810 | 951 | 999 |
| Germanium: | | | | |
| Oxide | tons | 12 | 15 | 15 |
| Metal | do | 22 | 28 | 17 |
| Gold: | | | | |
| Mine output, metal content | thousand troy ounces | 243 | 188 | 140 |
| Metal | do | 846 | 1,053 | 1,123 |
| Indium metal | do | 498 | e 550 | e 550 |

See footnotes at end of table.

## Table 1.—Japan: Production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel: | | | |
| Iron ore and iron sand concentrate | 1,347 | 1,007 | 778 |
| Roasted pyrite concentrate (50% or more Fe) | 1,075 | 891 | 893 |
| Pig iron and blast furnace ferroalloys | 74,055 | 90,007 | 90,436 |
| Electric furnace ferroalloys: | | | |
| Ferrochrome | 303 | 443 | 542 |
| Ferromanganese | 553 | 617 | 624 |
| Ferronickel | 189 | 200 | 251 |
| Ferrosilicon | 309 | 354 | 369 |
| Silicomanganese | 343 | 376 | 448 |
| Other [2] | 33 | 25 | 21 |
| Steel: | | | |
| Crude | 96,900 | 119,322 | 117,143 |
| Semimanufactures, hot rolled: | | | |
| Ordinary steel | 74,924 | 92,574 | 91,026 |
| Special steels | 7,175 | 9,161 | 9,324 |
| Lead: | | | |
| Mine output, metal content | 63 | 53 | 44 |
| Metal, refined: | | | |
| Primary | r 192 | 189 | 179 |
| Secondary | 31 | 39 | 49 |
| Magnesium metal: | | | |
| Primary tons | 10,890 | 11,203 | 8,923 |
| Secondary do | r 5,082 | 8,107 | 10,877 |
| Manganese: | | | |
| Ore and concentrate, gross weight | 261 | 189 | 167 |
| Oxide | 39 | 38 | 45 |
| Metal tons | r 12,657 | 10,080 | 8,659 |
| Mercury: | | | |
| Mine output, metal content 76-pound flasks | r 5,019 | 3,742 | 551 |
| Metal do | r 5,172 | 3,742 | 1,595 |
| Molybdenum: | | | |
| Concentrate output, metal content tons | 224 | 157 | 106 |
| Metal do | 272 | 458 | 341 |
| Nickel metal, primary do | r 16,492 | 21,726 | 20,992 |
| Platinum-group metals: | | | |
| Palladium metal troy ounces | 5,659 | 10,014 | 13,419 |
| Platinum metal do | 4,240 | 6,827 | 5,451 |
| Rare-earth metals: | | | |
| Lanthanum oxide tons | r 106 | 161 | 130 |
| Cerium metal do | 166 | NA | 289 |
| Selenium, elemental do | 335 | 343 | 363 |
| Silicon metal do | 190 | 247 | 249 |
| Silver: | | | |
| Mine output, metal content thousand troy ounces | r 10,047 | 8,552 | 7,314 |
| Metal, primary do | r 30,849 | 31,612 | 32,121 |
| Tellurium, elemental tons | 35 | 24 | 26 |
| Tin: | | | |
| Mine output, metal content long tons | 359 | 796 | 539 |
| Metal: | | | |
| Primary do | 1,329 | 1,329 | 1,307 |
| Secondary do | 164 | 120 | 100 |
| Titanium: | | | |
| Concentrate, gross weight tons | 2,115 | 1,506 | 1,398 |
| Slag do | 3,328 | 4,255 | 4,404 |
| Metal do | 4,658 | 6,507 | 8,913 |
| Tungsten: | | | |
| Mine output, metal content do | r 898 | 940 | 810 |
| Metal do | r 1,358 | 2,018 | 1,655 |
| Uranium metal kilograms | 1,530 | e 2,000 | 10,535 |
| Zinc: | | | |
| Mine output, metal content | r 152 | 264 | 241 |
| Oxide | 62 | 64 | 56 |
| Metal: | | | |
| Primary | 805 | 844 | 850 |
| Secondary | 23 | 25 | 22 |
| Zirconium metal kilograms | r 74,891 | 149,154 | 15,810 |
| NONMETALS | | | |
| Asbestos | 14 | 9 | 5 |
| Barite | r 66 | 63 | 38 |
| Bromine, elemental | 11 | e 11 | e 11 |
| Cement, hydraulic | 66,333 | 78,024 | 72,684 |
| Clays: | | | |
| Fire clay | 2,023 | 1,353 | 1,411 |
| Kaolin | r 127 | 390 | 413 |
| Feldspar [3] | r 517 | 548 | 552 |
| Fertilizer materials: | | | |
| Crude potassic (potassium carbonate), gross weight | 23 | 29 | 27 |

See footnotes at end of table.

## Table 1.—Japan: Production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials—Continued | | | |
| Manufactured: | | | |
| Nitrogenous [4] | r 2,125 | 2,454 | 2,204 |
| Superphosphates | 716 | 700 | 798 |
| Fluorspar, all grades | 8 | e 8 | e 8 |
| Graphite (crystalline) tons | 853 | r e 800 | e 800 |
| Gypsum | 465 | 378 | 334 |
| Iodine, elemental tons | 7,493 | 7,292 | 6,647 |
| Lime (quicklime) | 10,130 | 11,815 | 11,215 |
| Pyrite and pyrrhotite (including cupreous): | | | |
| Gross weight | r 2,097 | 1,275 | 1,286 |
| Sulfur content | 767 | 569 | 626 |
| Salt, all types | 687 | 1,015 | 1,115 |
| Stone, sand and gravel, n.e.s., crushed and broken stone: | | | |
| Dolomite | r 2,723 | 2,850 | 3,390 |
| Limestone | r 134,197 | 163,213 | 160,789 |
| Sulfur, elemental: | | | |
| Native, other than Frasch [5] | 17 | e 16 | e 16 |
| Content of pyrite | 767 | 569 | 626 |
| Byproduct | 499 | 681 | 722 |
| Total | 1,283 | 1,266 | 1,364 |
| Sulfuric acid | 6,692 | 7,116 | 7,127 |
| Talc and related materials: | | | |
| Pyrophyllite | r 1,365 | 1,418 | 1,396 |
| Talc | r 133 | 146 | 178 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | 341 | 404 | 376 |
| Coal: | | | |
| Anthracite | 457 | 217 | 140 |
| Bituminous [6] | 27,641 | 22,197 | 20,193 |
| Lignite | 102 | 86 | 75 |
| Total | 28,200 | 22,500 | 20,408 |
| Coke including breeze: | | | |
| Metallurgical coke | 36,146 | 44,316 | 45,632 |
| Metallurgical coke breeze | 1,863 | 1,826 | 2,512 |
| Gashouse coke including breeze | 4,421 | 4,715 | 4,788 |
| Fuel briquets, all grades | 920 | 946 | 1,027 |
| Gas, natural: | | | |
| Gross production [7] million cubic feet | r 96,763 | e 104,000 | e 102,000 |
| Marketed [7] do | r 95,677 | 102,553 | 100,540 |
| Natural gas liquids: | | | |
| Natural gasoline thousand 42-gallon barrels | r 30 | 44 | 41 |
| Liquefied petroleum gas from natural gas (from field plants only) do | 137 | 151 | 172 |
| Peat e | 70 | 70 | 70 |
| Petroleum: | | | |
| Crude oil thousand 42-gallon barrels | 5,241 | 5,141 | 4,935 |
| Refinery products: | | | |
| Gasoline: | | | |
| Aviation do | 401 | 342 | 226 |
| Other do | 152,359 | 169,154 | 168,443 |
| Jet fuel do | 21,328 | 26,048 | 20,254 |
| Kerosine do | 106,792 | 144,570 | 139,126 |
| Distillate fuel oil do | 180,184 | 226,234 | 224,980 |
| Residual fuel oil do | 657,568 | 764,062 | 742,364 |
| Lubricants do | 15,817 | 17,762 | 15,857 |
| Other: | | | |
| Asphalt and bitumen do | 27,744 | 31,661 | 28,476 |
| Liquefied petroleum gas do | 45,581 | 51,607 | 51,359 |
| Naphtha do | 169,315 | 196,586 | 191,362 |
| Paraffin do | 1,195 | 1,322 | 1,150 |
| Petroleum coke do | 1,100 | 1,185 | 1,154 |
| Unfinished oils do | 52,124 | 38,361 | 41,629 |
| Refinery fuel and losses do | 66,178 | 73,039 | 74,382 |
| Total do | 1,497,686 | 1,741,933 | 1,700,762 |

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Revised to none.

[2] Includes (but not limited to) ferromolybdenum, ferrotungsten, ferrovanadium, and silicochromium.

[3] Includes aplite as follows in thousand tons: 1972—455; 1973—497; 1974—490, and saba as follows in thousand tons: 1972—1; 1973—NA; 1974—NA.

[4] Nitrogen content of fertilizer for year ended June 30 of that stated.

[5] Includes a small amount of byproduct sulfur recovered from sulfide ores as well as sulfur content of sulfur ores.

[6] Includes a small amount of natural coke.

[7] Includes output from gas mines and coal mines.

## TRADE

Japan's overall trade in 1974 totaled about Y34,274.3 billion (rough conversion, Y291.7=US$1.00); exports totaled Y16,207.9 billion and imports, Y18,076.4 billion. Mineral and related products were an important part of the total. Mineral exports during the year comprised about 25% of all exports, and mineral imports about 55% of all imports. The leading mineral export was iron and steel, accounting for nearly four-fifths of the value of all mineral exports and one-fifth of total commodity exports. Steel exports in 1974 approximated Y3,148.9 billion or on the order of US$10.8 billion.

The most important minerals imported in 1974 were as follows, with rounded values in billions of yen: crude oil, 5,504; iron ore, 606; coal and coke, 845; nonferrous metal ores, 795 (477 for copper); nonferrous metals, 590 (205 for copper); refined petroleum, 657; natural gas, 250; and nonmetallics, 378.

Details on mineral exports and imports are given in the following tabulations in billion yen:

| Exports [1] | 1973 | 1974 |
|---|---|---|
| METALS | | |
| Iron and steel | 1,441.5 | 3,148.9 |
| Iron and steel scrap | 5.5 | 12.6 |
| Nonferrous metals: | | |
| Copper | 41.2 | 208.8 |
| Aluminum | 11.8 | 28.3 |
| Zinc | 10.3 | 43.5 |
| Other | 20.6 | 52.2 |
| NONMETALS | | |
| Inorganic chemicals | 33.9 | 129.6 |
| Cement | 4.8 | 23.2 |
| Chemical fertilizers | 65.5 | 137.5 |
| Nonmetallic manufactures | 150.0 | 177.7 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Petroleum products | 19.0 | 62.1 |
| Other | 6.1 | 12.2 |
| Total: | | |
| Mineral commodities | 1,810.2 | 4,036.6 |
| All commodities | 10,026.5 | 16,207.9 |

[1] Weighted average for 1974 was about Y291.7=US$1.00. The exchange rate was about 300 to 1 during January, February, and most of second half 1974; but it was 270 to 1 in March and moving up slowly to 300 to 1 in the next few months.

| Imports [1] | 1973 | 1974 |
|---|---|---|
| METALS | | |
| Iron and steel: | | |
| Iron ore | 450.3 | 605.9 |
| Scrap | 104.7 | 148.3 |
| Metal | 65.1 | 116.8 |
| Nonferrous metals: | | |
| Ores and concentrates: | | |
| Copper | 320.3 | 477.3 |
| Lead | 15.0 | 21.4 |
| Zinc | 47.5 | 76.8 |
| Nickel | 46.1 | 68.3 |
| Bauxite | 17.1 | 22.5 |
| Manganese | 25.3 | 44.4 |
| Other | 40.0 | 58.8 |
| Scrap | 29.9 | 25.7 |
| Metal: | | |
| Copper | 184.9 | 205.2 |
| Silver and platinum group | 98.8 | 131.1 |
| Aluminum | 75.6 | 119.4 |
| Tin | 45.2 | 70.7 |
| Nickel | 17.0 | 24.5 |
| Other | 31.1 | 39.0 |
| NONMETALS | | |
| Inorganic chemicals | 31.4 | 50.6 |
| Salt | 17.7 | 27.0 |
| Phosphate rock | 20.0 | 63.8 |
| Manufactured fertilizers (mainly potassic) | 21.5 | 41.1 |
| Other crude fertilizers and minerals | 54.9 | 63.8 |
| Nonmetallic manufactures | 160.2 | 131.4 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Coal and coke | 368.9 | 844.9 |
| Petroleum: | | |
| Crude | 1,633.0 | 5,503.9 |
| Refinery products | 197.6 | 656.5 |
| Natural gas | 66.6 | 249.8 |
| Total: | | |
| Mineral commodities | 4,185.4 | 9,888.6 |
| All commodities | 10,404.4 | 18,076.4 |

[1] Weighted average for 1974 was about Y291.7=US$1.00. The exchange rate was about 300 to 1 during January, February, and most of second half 1974; but it was 270 to 1 in March and moving up slowly to 300 to 1 in the next few months.

## Table 2.—Japan: Exports of mineral commodities [1]

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal destinations, 1973 |
|---|---|---|---|---|
| METALS | | | | |
| Aluminum: | | | | |
| Bauxite and concentrate -- tons -- | 7,905 | 316 | 146 | Mainly to Republic of Korea. |
| Oxide (alumina) and hydroxide -- | 220 | 183 | 79 | U.S.S.R. 50; United States 50; Republic of Korea 35. |
| Fused alumina ---------- tons -- | 5,223 | 6,431 | 6,054 | Republic of Korea 2,777; Taiwan 2,615; Australia 244. |
| Metal including alloys, all forms -- | 45 | 34 | 69 | Republic of Korea 6; United States 6; Indonesia 4. |
| Arsenic trioxide, pentoxide, acids ---------- tons -- | 128 | 47 | 20 | Mainly to Republic of Korea. |
| Beryllium metal including alloys, all forms ---------- kilograms -- | 228 | 28 | (2) | All to Hong Kong. |
| Bismuth metal including alloys, all forms ---------- tons -- | 613 | 531 | 507 | Netherlands 319; United States 113; United Kingdom 85. |
| Cadmium metal including alloys, all forms ---------- do ---- | 1,018 | 1,513 | 1,606 | Netherlands 1,091; Belgium-Luxembourg 154; France 106. |
| Chromium: | | | | |
| Chromite ---------- do ---- | -- | 71 | 244 | All to Thailand. |
| Oxide and hydroxide----- do ---- | 2,405 | 1,661 | 1,361 | United States 692; Republic of Korea 583; Taiwan 319. |

See footnotes at end of table.

## Table 2.—Japan: Exports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal destinations, 1973 |
|---|---|---|---|---|
| METALS—Continued | | | | |
| Cobalt oxide and hydroxide -- tons -- | 5 | 16 | 12 | Republic of Korea 10; North Vietnam 4; Taiwan 1. |
| Columbium and tantalum, tantalum metal, including alloys, all forms ---------- kilograms -- | 2,321 | 545 | 25,298 | People's Republic of China 300; West Germany 113; United States 66. |
| Copper: | | | | |
| Ore and concentrate ----- tons -- | 4,550 | -- | 2,299 | |
| Copper sulfate ---------- do ---- | 1,754 | 268 | 379 | Republic of Korea 64; Taiwan 60; Malaysia 51. |
| Metal including alloys, all forms -- | 86 | 80 | 344 | United States 19; Taiwan 18; Hong Kong 11. |
| Iron and steel: | | | | |
| Ore and concentrate ------ tons -- | 210 | 2 | -- | All to Indonesia. |
| Metal: | | | | |
| Scrap ---------- do ---- | 221,588 | 208,381 | 301,163 | Republic of Korea 154,365; Taiwan 50,052; Thailand 3,513. |
| Pig iron, including cast iron ---------- do ---- | 381,744 | 108,183 | 72,070 | People's Republic of China 62,689; Taiwan 25,290; Republic of Korea 17,283. |
| Sponge iron, powder, shot ---------- do ---- | 8,038 | 7,009 | 9,079 | Australia 5,107; Republic of Korea 783; United Kingdom 695. |
| Spiegeleisen ---------- | -- | -- | (3) | |
| Ferroalloys: | | | | |
| Ferromanganese --------- | 50 | 26 | 54 | United States 17; Iran 5; Singapore 1. |
| Other ---------- | 56 | 24 | 123 | United States 14; Singapore 2; Australia 2. |
| Steel, primary forms -------- | 1,789 | 5,233 | 7,595 | Republic of Korea 1,205; Argentina 891; United States 618. |
| Semimanufactures: | | | | |
| Bars, rods, angles, shapes, sections ------- | 3,132 | 3,636 | 7,068 | United States 885; People's Republic of China 282; U.S.S.R. 263. |
| Universals, plates, sheets: | | | | |
| Universals, plates, sheets, uncoated --- | 9,665 | 9,274 | 9,640 | United States 1,438; People's Republic of China 767; Taiwan 559. |
| Tinned plates and sheets ---------- | 832 | 888 | 1,049 | United States 244; Taiwan 80; U.S.S.R. 70. |
| Other coated plates and sheets --------- | 1,476 | 1,548 | 1,562 | United States 568; West Germany 78; Iran 74. |
| Hoop and strip ---------- | 557 | 670 | 734 | Indonesia 78; United States 48; Canada 46. |
| Rails and accessories ---- | 37 | 73 | 114 | Taiwan 34; Republic of Korea 14; Australia 10. |
| Wire ---------- | 463 | 419 | 511 | United States 190; Thailand 28; Indonesia 24. |
| Tubes, pipes, fittings ---- | 2,911 | 2,980 | 3,856 | United States 727; People's Republic of China 300; Saudi Arabia 229. |
| Castings and forgings, rough ---------- | 16 | 12 | 13 | United States 8; Republic of South Africa 2. |
| Lead: | | | | |
| Ore and concentrate ----- tons -- | 1,466 | -- | 7,405 | |
| Oxides ---------- do ---- | r 64 | 195 | 66 | Mainly to Taiwan. |
| Metal including alloys, all forms ---------- | 6 | 5 | 35 | India 3; Republic of Korea 1; Taiwan 1. |
| Magnesium metal including alloys, all forms ---------- tons -- | 89 | 117 | 1,461 | Republic of Korea 72; Taiwan 21; Malaysia 21. |

See footnotes at end of table.

## Table 2.—Japan: Exports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal destinations, 1973 |
|---|---|---|---|---|
| METALS—Continued | | | | |
| Manganese: | | | | |
| Ore and concentrate ____ tons __ | 3,350 | 1,812 | 4,887 | Egypt 479; Taiwan 471; Thailand 460. |
| Oxides ____ | 41 | 39 | 36 | United Kingdom 4; Indonesia 3; France 3. |
| Mercury ____ 76-pound flasks __ | 370 | 1,955 | 958 | Mainly to Algeria. |
| Molybdenum metal including alloys, all forms ____ tons __ | 22 | 35 | 21 | Taiwan 10; Republic of Korea 7; Hungary 6. |
| Nickel metal including alloys, all forms ____ do ____ | 744 | 934 | 1,684 | Republic of Korea 246; Thailand 118; India 111. |
| Phosphorus, elemental (red) _ do ____ | r 340 | 47 | 72 | India 20; Philippines 20; South Vietnam 3. |
| Platinum-group metals and silver: | | | | |
| Ore and concentrate ____ do ____ | __ | 25 | __ | All to Republic of Korea. |
| Waste and sweepings ____ do ____ | __ | 5 | 11 | All to United States. |
| Metals including alloys: | | | | |
| Platinum group thousand troy ounces __ | 175 | 214 | 159 | United States 86; United Kingdom 62; People's Republic of China 45. |
| Silver ____ do ____ | 522 | 645 | 9,976 | Taiwan 273; Singapore 104; Republic of Korea 101. |
| Selenium, elemental ____ tons __ | 213 | 168 | 203 | Netherlands 99; United Kingdom 16; Canada 12. |
| Tin: | | | | |
| Ore and concentrate _ long tons __ | 16 | __ | __ | |
| Oxides ____ do ____ | 38 | 188 | 55 | United States 89; Netherlands 48; Brazil 18. |
| Metal including alloys, all forms ____ do ____ | 581 | r 1,530 | 1,825 | Iraq 304; Philippines 252; Singapore 183. |
| Titanium: | | | | |
| Oxide ____ | 15 | 29 | 28 | Mainly to United States. |
| Metal including alloys, all forms ____ tons __ | 3,600 | 2,771 | 3,629 | United States 1,852; West Germany 216; Italy 213. |
| Tungsten: | | | | |
| Ore and concentrate ____ do ____ | __ | 31 | __ | All to Netherlands. |
| Metal including alloys, all forms ____ do ____ | 81 | 64 | 114 | U.S.S.R. 24; People's Republic of China 9; Republic of Korea 8. |
| Uranium and thorium metal including alloys, all forms ____ kilograms __ | 160 | __ | __ | |
| Zinc: | | | | |
| Ore and concentrate ____ tons __ | 880 | 24,550 | __ | North Korea 10,750; U.S.S.R. 7,000; Spain 5,600. |
| Oxide ____ do ____ | 1,605 | 889 | 2,492 | Taiwan 309; Republic of Korea 240; Australia 128. |
| Metal including alloys, all forms ____ | 111 | 69 | 133 | United States 29; Republic of Korea 11; India 5. |
| Other: | | | | |
| Ore and concentrate: | | | | |
| Of titanium, molybdenum, tantalum, vanadium, zirconium ____ | 295 | 321 | 655 | Republic of Korea 210; Taiwan 61; Philippines 50. |
| Of base metals, n.e.s _ do ____ | 46 | 10 | 35 | Mainly to Republic of Korea. |
| Ash and residues containing nonferrous metals ____ do ____ | 1,092 | 9,872 | 7,130 | Mainly to Belgium-Luxembourg. |
| Oxides, hydroxides, peroxides of metals, n.e.s ____ do ____ | r 1,801 | r 1,176 | 2,220 | Taiwan 410; People's Republic of China 240; Republic of Korea 182. |

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities [1]—Continued
(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal destinations, 1973 |
|---|---|---|---|---|
| METALS—Continued | | | | |
| Metals including alloys, all forms: | | | | |
| Phosphorus and other metalloids ---------- tons -- | 113 | 368 | 502 | United States 249; Taiwan 65; Republic of Korea 38. |
| Alkali, alkaline-earth, rare-earth metals ---------- do ---- | 47 | 120 | 119 | Taiwan 61; West Germany 20; Italy 14. |
| Pyrophoric alloys -------- do ---- | 106 | 110 | 125 | Singapore 27; Hong Kong 22; France 16. |
| Base metals including alloys, all forms, n.e.s -------- do ---- | 8,800 | 8,000 | 7,464 | United States 1,934; West Germany 1,481; United Kingdom 1,027. |
| NONMETALS | | | | |
| Abrasives, natural, n.e.s.: | | | | |
| Emery ---------- do ---- | 1,180 | 1,491 | 931 | Taiwan 987; Republic of Korea 221; Hong Kong 139. |
| Natural abrasives, n.e.s -- do ---- | 366 | 703 | 363 | Republic of Korea 243; Taiwan 194; People's Republic of China 157. |
| Dust and powder of precious and semiprecious stones thousand carats -- | 8,871 | 1,112 | 1,387 | Mainly to United States. |
| Grinding and polishing wheels and stones ---------- tons -- | 2,962 | 3,554 | 3,111 | Thailand 562; United States 449; Singapore 260. |
| Asbestos ---------- do ---- | 758 | 257 | 180 | Philippines 90; Indonesia 40; Saudi Arabia 33. |
| Barite and witherite -------- do ---- | 390 | 100 | -- | All to Republic of Korea. |
| Boron materials: | | | | |
| Crude natural borates --- do ---- | -- | 150 | 1,207 | All to Taiwan. |
| Oxide and acid ---------- do ---- | 107 | 121 | 1,155 | Taiwan 66; Bangladesh 19; Republic of Korea 12. |
| Cement ---------- | 1,544 | 857 | 2,302 | Singapore 367; Indonesia 176; Hong Kong 82. |
| Chalk ---------- tons -- | 3,675 | 949 | 36 | Hong Kong 500; Singapore 235; Taiwan 115. |
| Clays and clay products (including all refractory brick): | | | | |
| Crude clays, n.e.s -------- do ---- | 54,027 | 62,451 | 56,733 | Philippines 15,465; Taiwan 14,138; United Kingdom 5,188. |
| Products: | | | | |
| Refractory (including nonclay brick) ---- do ---- | 113,818 | 92,244 | 125,901 | Brazil 17,874; Republic of Korea 16,803; India 9,524. |
| Nonrefractory [4] ------ do ---- | 71,976 | 54,592 | 47,814 | United States 19,677; Australia 8,382; Hong Kong 6,278. |
| Cryolite and chiolite ---------- do ---- | 2 | 18 | 11 | Mainly to Taiwan. |
| Diamond: | | | | |
| Gem, not set or strung - carats -- | 5,590 | 8,785 | 7,460 | Hong Kong 5,860; Belgium-Luxembourg 2,325; Italy 370. |
| Industrial ---- thousand carats -- | 103 | 93 | 11 | United States 34; Taiwan 28; United Kingdom 21. |
| Diatomite and other infusorial earth ---------- tons -- | 1,414 | 1,294 | 981 | Taiwan 220; Republic of Korea 193; Republic of South Africa 174. |
| Feldspar and fluorspar: | | | | |
| Feldspar ---------- do ---- | 3,191 | 5,438 | 7,409 | Taiwan 3,532; Malaysia 900; Philippines 623. |
| Fluorspar, leucite, nepheline, nepheline syenite ------- do ---- | 19 | 18,043 | 61 | Mainly to U.S.S.R. |
| Fertilizer materials: | | | | |
| Crude ---------- do ---- | 36 | 2,930 | -- | All to Republic of Korea. |
| Manufactured: | | | | |
| Nitrogenous [5] ---------- | 4,048 | 3,454 | 3,005 | India 465; Indonesia 325; Philippines 267. |
| Phosphatic ---------- | 87 | 37 | 24 | Fiji 8; Sri Lanka 6; Indonesia 5. |

See footnotes at end of table.

## Table 2.—Japan: Exports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal destinations, 1973 |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Fertilizer materials—Continued | | | | |
| Manufactured—Continued | | | | |
| Potassic | 6 | 2 | (6) | Mainly to Republic of Korea. |
| Other, including mixed | 228 | 166 | 74 | Thailand 113; Sri Lanka 13; Nepal 11. |
| Ammonia tons | 99,438 | 119,919 | 144,738 | Philippines 88,140; Republic of Korea 31,091; Hong Kong 371. |
| Graphite, natural do | 420 | 440 | 418 | Taiwan 132; Pakistan 123; Indonesia 70. |
| Gypsum and plasters do | 2,537 | 2,546 | 2,843 | Taiwan 1,012; Republic of Korea 565; Hong Kong 390. |
| Iodine do | 6,551 | 6,265 | 6,717 | United States 2,628; United Kingdom 783; France 718. |
| Kyanite and related materials do | 5,204 | 10,676 | 20,768 | Taiwan 6,838; Republic of Korea 2,791; Thailand 270. |
| Lime do | 7,164 | 23,317 | 31,484 | Mainly to Bismarck Archipelago. |
| Magnesite do | 68 | 100 | 1,134 | Republic of Korea 50; Taiwan 50. |
| Mica do | 390 | 171 | 257 | Republic of Korea 68; Taiwan 47; Thailand 29. |
| Pigments, mineral, iron oxides, processed do | 2,088 | 5,248 | 12,342 | Taiwan 1,954; United States 1,078; Australia 574. |
| Precious and semiprecious stones, except diamond: | | | | |
| Natural thousand carats | 230,511 | 222,873 | 325,231 | Republic of Korea 155,246; West Germany 26,166; United States 19,950. |
| Manufactured do | 44,550 | 72,742 | 112,917 | United States 21,774; Republic of Korea 17,560; Netherlands 16,650. |
| Pyrite (gross weight) tons | -- | 3,209 | -- | All to Republic of Korea. |
| Salt and brine do | 311 | 533 | 1,120 | Bismarck Archipelago 225; United States 116; Mauritius 90. |
| Sodium and potassium compounds, n.e.s.: | | | | |
| Caustic soda | 186 | 185 | 331 | Mainly to Australia. |
| Caustic potash, sodic and potassic peroxides | 5 | 3 | 4 | People's Republic of China 1. |
| Stone, sand and gravel: | | | | |
| Dimension stone tons | 826 | 1,714 | 1,529 | North Korea 1,220; Republic of Korea 169; Australia 102. |
| Dolomite, chiefly refractory grade do | 3,772 | 3,193 | 6,025 | Mainly to Philippines. |
| Gravel and crushed rock do | 4,357 | 1,922 | 1,199 | Singapore 407; Thailand 400; Puerto Rico 201. |
| Limestone (except dimension) | 881 | 1,442 | 1,469 | Mainly to Australia. |
| Quartz and quartzite tons | 160 | 256 | 1,165 | Taiwan 150; Thailand 80; West Germany 20. |
| Sand, excluding metal-bearing do | 3,499 | 3,452 | 1,575 | Taiwan 1,270; Republic of Korea 898; Hong Kong 444. |
| Sulfur: | | | | |
| Elemental: | | | | |
| Other than colloidal do | 47,318 | 45,051 | 62,986 | Mainly to Republic of Korea. |
| Colloidal do | 571 | 2,421 | 114 | Mainly to Thailand. |
| Sulfur dioxide do | 387 | 180 | 181 | Mainly to Australia. |
| Sulfuric acid do | 462 | 176 | 289 | Republic of Korea 75; Philippines 33; Hong Kong 24. |
| Talc and steatite do | 765 | 829 | 746 | Singapore 500; Taiwan 140; Indonesia 49. |

See footnotes at end of table.

## Table 2.—Japan: Exports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal destinations, 1973 |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Other nonmetals, n.e.s.: | | | | |
| Crude | 5 | 5 | 7 | Republic of Korea 1; Taiwan 1; Philippines 1. |
| Slag, dross, similar waste, not metal bearing | 20 | 25 | 39 | Mainly to Republic of Korea. |
| Oxides, hydroxides, peroxides of magnesium, strontium, barium (including magnesia clinker) | 87 | 94 | 82 | Australia 23; United States 18; Venezuela 8. |
| Fluorine and bromine ---------- kilograms | 2,500 | 1,175 | 8,090 | Mainly to Taiwan. |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Asphalt and bitumen, natural - tons | 6 | -- | 11 | |
| Carbon black and gas carbon: | | | | |
| Carbon black | 28 | 16 | 14 | Thailand 3; Singapore 2; Taiwan 2. |
| Gas carbon ---------- kilograms | 3 | -- | 2,551 | |
| Coal, all grades, including briquets | 9 | 24 | 132 | Republic of Korea 17; Taiwan 3; Thailand 3. |
| Coke and semicoke | 394 | 564 | 656 | Peru 165; Venezuela 160; Taiwan 93. |
| Gas, manufactured only ----- tons | 301 | 1 | (7) | All to Indonesia. |
| Hydrogen and rare gases (helium, neon, argon, krypton, xenon) ---------- do | 278 | 563 | 442 | Republic of Korea 159; Philippines 68; Iran 57. |
| Peat, including peat briquets and litter ---------- do | 20 | -- | -- | |
| Petroleum: | | | | |
| Crude and partly refined thousand 42-gallon barrels | 7,610 | 258 | 16 | Mainly to Philippines. |
| Refinery products: | | | | |
| Nonbunker: | | | | |
| Gasoline ---------- do | 349 | 576 | 26 | United States 338; Thailand 130; Guam 41. |
| Kerosine and jet fuel ---------- do | 3,107 | 2,398 | 1,062 | Mainly to United States. |
| Distillate fuel oil - do | 519 | 945 | 495 | United States 468; Hong Kong 394; Mexico 77. |
| Residual fuel oil - do | 189 | 1,496 | 12,574 | Republic of Korea 519; Hong Kong 426; Singapore 286. |
| Lubricants ------ do | 3,188 | 2,229 | 4,496 | Republic of Korea 849; Taiwan 343; Indonesia 206. |
| Other: | | | | |
| Liquefied petroleum gas ------- do | 527 | 336 | 85 | Taiwan 235; Hong Kong 98; Australia 2. |
| Naphtha ---- do | 479 | 647 | 1,162 | United States 494; United Kingdom 148; New Zealand 4. |
| Mineral jelly and wax ------- do | 329 | 410 | 315 | United States 112; Republic of Korea 56; Australia 30. |
| Bitumen ----- do | 211 | 128 | 245 | Republic of Korea 42; Burma 34; Indonesia 31. |
| Unspecified -- do | 129 | 229 | 248 | Italy 62; West Germany 57; Republic of Korea 48. |
| Bunker: [8] | | | | |
| Kerosine and jet fuel ---------- do | 10,217 | 13,137 | NA | NA. |
| Distillate fuel oil ---------- do | 9,525 | 10,216 | NA | NA. |
| Residual fuel oil - do | 94,458 | 111,270 | NA | NA. |
| Other ---------- do | 314 | 428 | NA | NA. |

See footnotes at end of table.

## Table 2.—Japan: Exports of mineral commodities [1]—Continued
(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal destinations, 1973 |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 34 | 31 | 51 | Republic of Korea 22; Philippines 1; Bangladesh 1. |

r Revised. NA Not available.
[1] Excludes exports under Japanese-United States Mutual Defense Agreement or for account of U.S. military forces.
[2] Reported in value only: 1974, $3,894.
[3] Reported in value only: 1974, $3,922.
[4] Excludes mosaic tile valued at (thousand yen): 1972, 20,666,571; 1973, 26,471,496; 1974, 25,684,534.
[5] Includes exports of following amounts of urea containing more than 45% nitrogen: 1972, 2,511,128 tons; 1973, 2,454,739 tons; 1974, 2,249,275 tons.
[6] Less than ½ unit.
[7] Reported in value only: 1974, $2,393.
[8] Source: Ministry of International Trade and Industry (Tokyo, Japan), Yearbook of Petroleum Statistics 1972 and 1973.

## Table 3.—Japan: Imports of mineral commodities [1]
(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal sources, 1973 |
|---|---|---|---|---|
| METALS | | | | |
| Aluminum: | | | | |
| Bauxite and concentrate | 4,997 | 5,615 | 5,311 | Australia 3,457; Indonesia 1,137; Malaysia 931. |
| Oxide and hydroxide | 548 | 452 | 647 | Mainly from Australia. |
| Fused aluminum (artificial corundum) tons | 201 | 565 | 2,615 | United Kingdom 323; West Germany 115; United States 85. |
| Metal including alloys: | | | | |
| Scrap | 37 | 48 | 25 | United States 32; South Vietnam 5; Canada 3. |
| Unwrought | 325 | 476 | 479 | Canada 80; Bahrain 77; New Zealand 77. |
| Semimanufactures | 8 | 28 | 44 | United States 12; Romania 3; Republic of Korea 2. |
| Antimony: | | | | |
| Ore and concentrate tons | 13,312 | 13,959 | 10,857 | Bolivia 7,345; People's Republic of China 3,014; Thailand 1,526. |
| Metal including alloys, all forms do | 262 | 1,248 | 589 | Mainly from People's Republic of China. |
| Arsenic: | | | | |
| Natural sulfides do | 2 | 5 | 40 | All from People's Republic of China. |
| Trioxide, pentoxide, acids do | 1,442 | 1,971 | 1,082 | People's Republic of China 1,266; France 533; United States 59. |
| Beryllium metal including alloys, all forms kilograms | 9,084 | 8,696 | 3,139 | Mainly from United States. |
| Bismuth metal including alloys, all forms tons | 1 | 2 | 5 | Mainly from United Kingdom. |
| Cadmium metal including alloys, all forms kilograms | 4 | 3,984 | 9,118 | Mainly from North Korea. |

See footnotes at end of table.

## Table 3.—Japan: Imports of mineral commodities [1]—Continued
(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal sources, 1973 |
|---|---|---|---|---|
| METALS—Continued | | | | |
| Chromium: | | | | |
| Ore and concentrate | 875 | 1,164 | 1,155 | Republic of South Africa 619; India 221; Philippines 115. |
| Oxide and hydroxide ----- tons | 955 | 2,016 | 1,645 | West Germany 862; U.S.S.R. 407; United States 394. |
| Cobalt: | | | | |
| Oxide and hydroxide ----- do | 684 | 944 | 820 | Mainly from Belgium-Luxembourg. |
| Metal including alloys, all forms ----- do | 2,952 | 4,657 | 3,716 | Zaire 3,626; United States 462; Belgium-Luxembourg 334. |
| Columbium and tantalum: | | | | |
| Columbium (niobium) ore and concentrate ----- do | 1,479 | 2,207 | 1,900 | Nigeria 1,344; Brazil 690; United Kingdom 60. |
| Tantalum: | | | | |
| Ore and concentrate - do | 59 | 84 | 109 | Australia 22; Belgium-Luxembourg 19; Zaire 15. |
| Metal including alloys, all forms ----- do | 23 | 49 | 66 | Mainly from United States. |
| Copper: | | | | |
| Ore and concentrate | 2,170 | 2,973 | 3,124 | Canada 1,182; Philippines 763; Bismarck Archipelago 381. |
| Matte, cement copper, native copper | 8 | 17 | 16 | Chile 9; Taiwan 6; United States 2. |
| Copper sulfate ----- tons | 101 | 152 | [2] 1,629 | Peru 100; France 49; United States 3. |
| Metal including alloys: | | | | |
| Scrap | 70 | 68 | 35 | Hong Kong 6; Singapore 4; Canada 3. |
| Unwrought | 303 | 410 | 303 | Zambia 187; United States 45; U.S.S.R. 43. |
| Semimanufactures --- tons | 1,864 | 12,355 | 16,664 | United States 6,517; Australia 1,522; West Germany 765 |
| Germanium: | | | | |
| Dioxide ----- do | 20 | 15 | 17 | Belgium-Luxembourg 8; U.S.S.R. 4; West Germany 3. |
| Metal including alloys, all forms ----- kilograms | 269 | 918 | 1,029 | Czechoslovakia 400; U.S.S.R. 358; Italy 156. |
| Indium metal including alloys, all forms ----- do | 50 | 1,424 | 7,787 | Mainly from United States. |
| Iron and steel: | | | | |
| Ore and concentrate, except roasted pyrite | 111,501 | 134,724 | 141,951 | Australia 64,239; India 19,112; Brazil 12,821. |
| Roasted pyrite ----- tons | 18,120 | -- | 68 | |
| Metal: | | | | |
| Scrap | 2,499 | 5,409 | 3,559 | Mainly from United States. |
| Pig iron, including cast iron | 1,004 | 1,547 | 1,291 | Republic of South Africa 400; Australia 378; U.S.S.R. 246. |
| Sponge iron, powder, shot | 13 | 15 | 22 | Mainly from Sweden. |
| Ferroalloys | 60 | 143 | 187 | Republic of South Africa 51; India 22; Norway 15. |
| Steel, primary forms | 64 | 142 | 133 | Brazil 77; Australia 32; Argentina 18. |
| Semimanufactures | 39 | 85 | 107 | Republic of Korea 27; United States 22; Canada 6. |

See footnotes at end of table.

## Table 3.—Japan: Imports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal sources, 1973 |
|---|---|---|---|---|
| METALS—Continued | | | | |
| Lead: | | | | |
| Ore and concentrate | 199 | 243 | 218 | Canada 158; Peru 37; Australia 25. |
| Oxides tons | 350 | 1,241 | 2,586 | Mexico 752; United States 324; Australia 70. |
| Metal including alloys: | | | | |
| Scrap do | 4,133 | 7,928 | 1,677 | United States 4,786; South Vietnam 1,892; Canada 619. |
| Unwrought do | 5,241 | 63,483 | 36,554 | United States 30,899; Australia 9,119; North Korea 7,206. |
| Semimanufactures do | 8 | 12 | 13 | United States 9; West Germany 2. |
| Magnesium metal including alloys, all forms do | 3,221 | 6,593 | 13,426 | U.S.S.R. 2,858; United States 2,582; Norway 950. |
| Manganese: | | | | |
| Ore and concentrate [3] | 2,921 | 3,364 | 3,908 | Republic of South Africa 1,476; India 695; Australia 626. |
| Oxides kilograms | 235 | 119 | 5 | Mainly from United States. |
| Mercury 76-pound flasks | 13,005 | 15,794 | 7,687 | Spain 4,743; Mexico 4,634; Algeria 2,401. |
| Molybdenum: | | | | |
| Ore and concentrate tons | 10,235 | 16,613 | 17,778 | United States 8,840; Canada 5,129; Chile 2,083. |
| Trioxide do | 123 | 447 | 520 | Netherlands 298; United 118; Canada 16. |
| Metal including alloys, all forms do | 143 | 289 | 147 | United States 118; West Germany 116; Austria 17. |
| Nickel: | | | | |
| Ore and concentrate | 3,152 | 3,539 | 4,218 | Mainly from New Caledonia. |
| Matte, speiss, similar materials | 13 | 30 | 40 | Canada 19; Australia 7; New Caledonia 4. |
| Metal including alloys: | | | | |
| Scrap tons | 1,828 | 1,225 | 1,436 | United Kingdom 486; United States 395; Canada 72. |
| Unwrought do | 12,310 | 15,238 | 16,699 | Canada 4,689; U.S.S.R. 4,548; Norway 2,131. |
| Semimanufactures do | 1,629 | 2,369 | 4,126 | United Kingdom 1,283; United States 365; West Germany 207. |
| Platinum-group metals: | | | | |
| Waste and sweepings value | -- | -- | $9,407 | |
| Metals including alloys, all forms: | | | | |
| Platinum thousand troy ounces | 1,121 | 1,337 | 1,194 | U.S.S.R. 555; Republic of South Africa 354; United Kingdom 198. |
| Palladium troy ounces | 929,153 | 869,846 | 678,361 | Mainly from U.S.S.R. |
| Rhodium do | 10,070 | 17,619 | 24,574 | U.S.S.R. 12,676; United Kingdom 2,566; United States 1,997. |
| Iridium, osmium, ruthenium do | 4,221 | 21,516 | 7,715 | United Kingdom 13,873; United States 5,701; Republic of South Africa 1,061. |
| Alloys do | 12,465 | 30,447 | 27,514 | West Germany 14,063; United States 10,542; United Kingdom 3,661. |
| Rare-earth metals: | | | | |
| Oxides and crude chlorides tons | 2,235 | 2,375 | 2,157 | India 1,280; United States 531; Brazil 244. |

See footnotes at end of table.

## Table 3.—Japan: Imports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal sources, 1973 |
|---|---|---|---|---|
| METALS—Continued | | | | |
| Rare-earth metals—Continued | | | | |
| Metals (yttrium, scandium, intermixtures) ____ kilograms __ | 204 | 10,190 | 26,141 | Mainly from Brazil. |
| Selenium, elemental _____ do ____ | 190 | 4,384 | 5,493 | Mainly from Republic of Korea. |
| Silicon _____ tons __ | 7,792 | 11,327 | 12,241 | Yugoslavia 5,005; Sweden 2,152; France 1,950. |
| Silver: | | | | |
| Ore and concentrate _____ tons __ | 5,485 | 3,770 | 3,050 | Mainly from Republic of Korea. |
| Waste and sweepings ___ value __ | $4,287 | $10,169 | $135,286 | All from Republic of Korea. |
| Metal including alloys, all forms thousand troy ounces __ | 18,582 | 34,273 | 30,989 | Mexico 18,256; Peru 5,481; Australia 4,487. |
| Tellurium _____ kilograms __ | 1,099 | 4,188 | 4,005 | Mainly from U.S.S.R. |
| Tin: | | | | |
| Ore and concentrate _ long tons __ | 26 | 10 | 3 | All from Australia. |
| Oxide _____ do ____ | 14 | 10 | 15 | Australia 7; United States 2; United Kingdom 1. |
| Metal including alloys, all forms _____ do ____ | 30,585 | r 35,265 | 30,747 | Malaysia 25,266; Indonesia 4,902; Thailand 3,584. |
| Titanium: | | | | |
| Ore and concentrate _____ | 446 | 494 | 681 | Australia 150; Malaysia 118; India 114. |
| Slag _____ | 52 | 78 | 46 | All from Canada. |
| Oxide _____ tons __ | 3,359 | 13,420 | 9,975 | West Germany 4,521; United States 2,154; France 1,688. |
| Tungsten: | | | | |
| Ore and concentrate _____ do ____ | 2,436 | 4,563 | 3,818 | Republic of Korea 1,473; Thailand 842; Canada 790. |
| Metal including alloys, all forms _____ do ____ | 60 | 246 | 336 | United States 119; West Germany 73; France 47. |
| Uranium and thorium: | | | | |
| Ore and concentrate _____ do ____ | 65 | 32 | 31 | All from Zaire. |
| Oxides (compounds of thorium or uranium depleted in U-235) _____ kilograms __ | 50,924 | 61,593 | 23,839 | All from France. |
| Metal including alloys, all forms _____ do ____ | 202 | 315 | [4] 4,212 | All from United States. |
| Vanadium pentoxide _____ tons __ | 2,039 | 2,632 | 3,099 | Republic of South Africa 1,683; West Germany 638; United States 311. |
| Zinc: | | | | |
| Ore and concentrate _____ | 1,116 | 1,205 | 1,216 | Canada 416; Peru 324; Australia 210. |
| Oxide _____ tons __ | 1,084 | 994 | 3,768 | U.S.S.R 639; Republic of South Africa 90; Republic of Korea 80. |
| Metal including alloys, all forms __ | 8 | 28 | 25 | North Korea 16; United States 5; U.S.S.R. 2. |
| Zirconium ore and concentrate (including zircon sand) ____ tons __ | 117,175 | 138,013 | 119,469 | Mainly from Australia. |
| Other: | | | | |
| Ore and concentrate of base metals, n.e.s _____ do ____ | 1,316 | 1,586 | 267 | United States 900; Brazil 376; Republic of South Africa 148. |
| Ash and residue containing nonferrous metals _____ do ____ | 14,229 | 9,499 | 11,057 | Australia 1,899; United States 1,430; Philippines 659. |
| Oxides, hydroxides pentoxides of metals, n.e.s.[5] _____ do ____ | 1,427 | 2,878 | 3,112 | United States 1,484; U.S.S.R. 650; West Germany 453. |

See footnotes at end of table.

## Table 3.—Japan: Imports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal sources, 1973 |
|---|---|---|---|---|
| METALS—Continued | | | | |
| Other—Continued | | | | |
| Metal including alloys, all forms: Metalloids [6] ---------- tons -- | 10,171 | 12,166 | 15,122 | Canada 5,239; U.S.S.R. 4,715; United States 2,132. |
| Alkali and alkaline-earth metals [7] ---------- do ---- | 23 | 52 | 223 | Mainly from United States. |
| Pyrophoric alloys (ferrocerium) ------ do ---- | 7 | 10 | 11 | Australia 4; France 2; United Kingdom 2. |
| Base metals including alloys, all forms, n.e.s ---- do ---- | r 607 | r 612 | 1,171 | U.S.S.R. 271; United States 242; United Kingdom 80. |
| NONMETALS | | | | |
| Abrasives, natural, except diamond, n.e.s.: Crude ---------- do ---- | 2,702 | 2,991 | 5,489 | United States 1,548; India 700; People's Republic of China 503. |
| Dust and powder of precious and semiprecious stones _ kilograms -- | 131 | 19,175 | 17,160 | Mainly from West Germany. |
| Grinding and polishing wheels and stones ---------- tons -- | 302 | 456 | 1,200 | United States 101; Belgium-Luxembourg 11; West Germany 11. |
| Asbestos ---------- | 279 | 342 | 352 | Canada 144; Republic of South Africa 112; U.S.S.R. 47. |
| Barite and witherite ---------- | 20 | 42 | 50 | People's Republic of China 31; India 9; Singapore 2. |
| Boron materials: | | | | |
| Crude natural borates ---------- | 42 | 43 | 56 | Mainly from Turkey. |
| Oxide and acid ---------- | 15 | 17 | 19 | Turkey 12; U.S.S.R. 3. |
| Cement ---------- | 5 | 348 | 77 | Republic of Korea 195; Taiwan 67; Philippines 53. |
| Clays and clay products: | | | | |
| Crude clays, n.e.s.: Kaolin ---------- | 276 | 342 | 351 | United States 219; Republic of Korea 77; U.S.S.R. 28. |
| Kyanite, andalusite, sillimanite | 19 | 25 | 29 | Republic of South Africa 14; India 9; United States 2 |
| Other ---------- | 259 | 344 | 427 | United States 139; Republic of South Africa 80; Republic of Korea 73. |
| Products: | | | | |
| Refractory (including nonclay brick) ---------- tons -- | 8,107 | 7,447 | 15,608 | United States 2,407; West Germany 1,512; Sweden 240. |
| Nonrefractory ------- do ---- | 6,291 | 15,537 | 17,194 | Italy 6,569; Republic of Korea 6,052; Taiwan 756. |
| Cryolite and chiolite --------- do ---- | 875 | 2,038 | 1,027 | Greenland 1,449; Denmark 589. |
| Diamond: | | | | |
| Gem, not set or strung thousand carats -- | 534 | 689 | 562 | Israel 247; Belgium-Luxembourg 146; India 78. |
| Industrial stones --------- do ---- | 814 | 1,157 | 823 | United States 349; Belgium-Luxembourg 224; United Kingdom 220. |
| Powder and dust -------- do ---- | 6,525 | 9,936 | 8,121 | United States 5,817; Ireland 1,280; United Kingdom 1,208. |
| Diatomite and other infusorial earth ---------- tons -- | 3,249 | 4,422 | 4,582 | Mainly from United States. |

See footnotes at end of table.

## Table 3.—Japan: Imports of mineral commodites [1]—Continued

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal sources, 1973 |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Feldspar, leucite, nepheline, nepheline syenite ____ tons __ | 2,508 | 9,881 | 20,633 | Mainly from People's Republic of China. |
| Fertilizer materials: | | | | |
| Crude: | | | | |
| Nitrogenous (natural sodium nitrate) ____ do ____ | 1,689 | 209 | 223 | All from People's Republic of China. |
| Phosphatic ____ | 3,040 | 3,190 | 3,845 | United States 1,931; Morocco 618; Jordan 198. |
| Potassic ____ tons __ | -- | -- | 781 | |
| Manufactured: | | | | |
| Nitrogenous ____ | 20 | 37 | 36 | Chile 19; United States 10; Netherlands 2. |
| Phosphatic ____ | 16 | 20 | 9 | Mainly from United States. |
| Potassic ____ | 1,176 | 1,322 | 1,520 | Canada 609; U.S.S.R. 258; United States 213. |
| Mixed ____ | 49 | 97 | 121 | Mainly from United States. |
| Ammonia ____ tons __ | 3 | 2 | 8 | All from United States. |
| Fluorspar ____ | 490 | 574 | 541 | Thailand 241; People's Republic of China 158; Republic of South Africa 114. |
| Graphite, natural ____ | 40 | 66 | 86 | Republic of Korea 39; North Korea 18; U.S.S.R. 5. |
| Gypsum and plasters ____ | 138 | 207 | 111 | Australia 93; Mexico 59; Morocco 54. |
| Magnesite and magnesia clinker ____ | 27 | 52 | 99 | Mainly from North Korea. |
| Mica, all forms ____ | 7 | 10 | 10 | India 6; Republic of Korea 3; Malagasy Republic 1. |
| Pigments, mineral, including processed iron oxides ____ tons __ | 3,148 | 3,950 | 3,297 | West Germany 2,338; Republic of Korea 1. |
| Precious and semiprecious stones, except diamond: | | | | |
| Natural ____ do ____ | 1,049 | 1,506 | 1,173 | Brazil 951; Republic of of South Africa 180; India 86. |
| Manufactured ____ do ____ | 12 | 19 | 27 | United States 15; Switzerland 2; U.S.S.R. 1. |
| Pyrite (gross weight) ____ do ____ | 3,471 | 25,867 | 65,535 | All from Philippines. |
| Salt ____ | 6,873 | 7,275 | 7,749 | Australia 3,180; Mexico 3,080; People's Republic of China 925. |
| Sodium carbonate, natural ___ tons __ | -- | 5 | -- | All from Brazil. |
| Sodium and potassium compounds, n.e.s.: | | | | |
| Caustic soda ____ do ____ | 108 | 75,037 | 39,954 | West Germany 34,734; United Kingdom 20,303; United States 7,622. |
| Caustic potash, sodic, potassic peroxides ____ do ____ | 10 | r 2,252 | 124 | Mainly from United States. |
| Stone, sand and gravel: | | | | |
| Dimension stone: | | | | |
| Crude and partly worked ____ | 191 | 462 | 489 | Taiwan 183; Republic of Korea 77; Republic of South Africa 73. |
| Worked ____ | 12 | 27 | 33 | Italy 7; Republic of Korea 6; People's Republic of China 4. |
| Dolomite, including agglomerated dolomite ____ | 20 | 19 | 28 | Mainly from Republic of Korea. |
| Gravel and crushed rock ____ | 40 | 68 | 153 | Taiwan 35; Republic of Korea 11; France 11. |
| Limestone ____ tons __ | 110 | 282 | 405 | All from France. |
| Quartz and quartzite ____ | 110 | 170 | 296 | Mainly from Republic of Korea. |
| Sand, excluding metal-bearing ____ | 262 | 535 | 640 | Mainly from Australia. |

See footnotes at end of table.

## Table 3.—Japan: Imports of mineral commodites [1]—Continued

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal sources, 1973 |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Sulfur: | | | | |
| Elemental: | | | | |
| Other than colloidal -- tons -- | 12,113 | 46,409 | 35,761 | Mexico 30,440; Canada 15,969. |
| Colloidal ---------- do ---- | 153 | 323 | 446 | Mainly from United States. |
| Sulfuric acid ---------- do ---- | 161 | 60,086 | 51,870 | Taiwan 36,924; Australia 10,485; Philippines 7,978. |
| Talc, steatite, soapstone, pyrophyllite - | 220 | 277 | 299 | People's Republic of China 173; North Korea 55; Republic of Korea 23. |
| Other nonmetals, n.e.s.: | | | | |
| Crude: | | | | |
| Meerschaum, amber, jet kilograms -- | -- | -- | 15 | |
| Unspecified ---------- | 201 | 283 | 709 | Republic of Korea 112; Philippines 68; Australia 38. |
| Slag, dross, similar waste, ash, including kelp, not metal bearing ---------- | 122 | 164 | 212 | India 60; United States 53; Republic of Korea 35. |
| Oxides, hydroxides, peroxides of magnesium, strontium, barium tons -- | 178 | 221 | 304 | Mainly from United States. |
| Bromine and iodine ------ do ---- | 1,324 | 1,187 | 195 | Chile 800; Israel 387. |
| Fluorine ---------- kilograms -- | 28 | 60 | 26 | All from United States. |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Asphalt and bitumen, natural -------- | 2 | 3 | 3 | Mainly from United States. |
| Carbon black ---------- | 4 | 8 | 17 | United States 5; United Kingdom 2. |
| Coal and briquets: | | | | |
| Anthracite ---------- | 756 | 1,031 | 1,517 | People's Republic of China 294; Republic of Korea 225; North Vietnam 185. |
| Bituminous: | | | | |
| Heavy coking coal, less than 8% ash ---------- | 20,459 | 22,001 | 17,623 | United States 12,938; Australia 5,737; Canada 1,486. |
| Heavy coking coal, more than 8% ash ---------- | 17,136 | 22,224 | 31,978 | Australia 11,531; Canada 7,825; U.S.S.R. 1,753. |
| Other coking coal ---------- | 10,927 | 11,598 | 13,033 | Australia 7,646; United States 2,502; Canada 1,010. |
| Lignite and lignite briquets ------ | 9 | 11 | 22 | Mainly from U.S.S.R. |
| Coke and semicoke ---------- | 15 | 41 | 238 | Mainly from Australia. |
| Gas, hydrocarbon (liquefied natural gas) -- thousand 42-gallon barrels -- | 11,040 | 22,583 | 39,373 | Brunei 11,763; United States 10,820. |
| Hydrogen, helium, rare gasses kilograms -- | 82,085 | r 89,124 | 85,568 | Mainly from United States. |
| Peat, including peat briquet and litter ---------- tons -- | 4,277 | 8,145 | 10,043 | U.S.S.R. 3,476; Poland 2,407; Canada 701. |
| Petroleum: | | | | |
| Crude and partly refined: | | | | |
| Crude thousand 42-gallon barrels -- | 1,447,835 | 1,700,531 | 1,640,078 | Iran 610,473; Saudi Arabia 328,498; Indonesia 256,975. |
| Partly refined -------- do ---- | 119,541 | 121,616 | 110,959 | Saudi Arabia 99,836; Kuwait 11,946; Indonesia 4,259. |
| Refinery products: | | | | |
| Gasoline ---------- do ---- | 896 | 1,316 | 924 | Mainly from Singapore. |

See footnotes at end of table.

Table 3.—Japan: Imports of mineral commodites [1]—Continued
(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 | Principal sources, 1973 |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Petroleum—Continued | | | | |
| Refinery products—Continued | | | | |
| Kerosine and jet fuel thousand 42-gallon barrels | 1,835 | 2,683 | 3,355 | Mainly from Singapore. |
| Distillate fuel oil ----- do ---- | 15,813 | 21,623 | 36,705 | Singapore 5,230; Bahrain 4,541; Australia 2,660. |
| Residual fuel oil ----- do ---- | 98,626 | 76,708 | 63,886 | Indonesia 45,236; Singapore 12,753; Kuwait 5,090. |
| Lubricants ---------- do ---- | 1,363 | 1,153 | 2,662 | Mainly from United States. |
| Other: | | | | |
| Liquefied petroleum gas do ---- | 49,472 | 59,028 | 65,461 | Saudi Arabia 18,742; Kuwait 15,935; Australia 11,329. |
| Naphtha -------- do ---- | r 36,788 | r 37,235 | 50,270 | Singapore 11,179; Kuwait 8,698; Saudi Arabia 4,683. |
| Petroleum coke -- do ---- | 9,781 | 10,521 | 13,371 | Mainly from United States. |
| Unspecified ------ do ---- | 807 | r 1,472 | 728 | United States 888; West Germany 197; Republic of Korea 195. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ------ | 25 | 54 | 89 | Republic of Korea 23; Australia 16; United States 13. |

r Revised.
[1] Excludes imports under Japanese-United States Mutual Defense Agreement or for account of U.S. military forces.
[2] Includes zinc sulfate.
[3] Includes ferruginous manganese and manganese dioxide.
[4] Partial figure; value of reported quantity is $77,096. An addition unreported quantity valued at $747 was also imported.
[5] Includes lithium hydroxide, beryllium oxide, mercury oxide, antimony trioxide, cuprous oxide and oxides, hydroxides, and peroxides, n.e.s., and silicon dioxides.
[6] Includes phosphorus, boron, and arsenic.
[7] Includes lithium, sodium, alkali-metals, n.e.s., and alkaline-earth metals.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Japan's primary aluminum production increased another 2.0% in 1974, reaching 1,118,374 tons (excluding 5,630 tons of superpure aluminum), according to the Japan Light Metal Association. In addition, 517,334 tons of secondary aluminum and alloy ingots was produced. Although Japan's production was far below that of the United States, it closely followed that of the Soviet Union and was ahead of Canadian production. Nonetheless, output near yearend declined slightly and most aluminum producers in Japan were revaluating their plans, particularly Mitsubishi Chemical Co. which was scheduling a cut of 40% early in 1975. Because of sluggish demand, Japan's aluminum stocks at yearend 1974 were about 242,000 tons compared with 66,000 tons in 1973.

Japan's internationally oriented aluminum industry has many commercial and investment ties with major foreign companies. Because of these specific relationships, large quantities of alumina were imported and sizable tonnages of aluminum were imported. During 1974 imports of alumina to produce aluminum were 633,325 tons (all from Australia), and imports of aluminum ingot were 384,819 tons (headed by New Zealand, 21%; Bahrain, 19%; Canada, 17%; and the United States, 13%). Imports of alloyed aluminum ingot were 94,088 tons (headed by the U.S.S.R., 44% and the United States, 13%). Japan has no bauxite, hence all needs must be met by imports. During 1974, approximately 5.3 million tons of bauxite were imported compared with 5.6 million tons in 1973. In 1974, Australia supplied about three-fifths, Indonesia one-fourth, and Malaysia, just under one-sixth.

Australia has become the principal raw material base for Japan's aluminum industry and its position is improving. During 1974, Japan imported about 3.2 million tons of bauxite from Australia. Nearly two-thirds of this came from the Weipa area, produced and sold by a consortium headed by Comalco Ltd. (Australia), and shipped mainly to Sumitomo Chemical Co., Ltd., and Showa Denko K.K., shareholders of Comalco. Weipa had labor troubles during the middle of the year. Bauxite from Darling Range, owned by Alcoa of Australia Ltd., was shipped mainly to Nippon Light Metal Company, Ltd. (NLM). Bauxite from Gove, owned by the Nabalco Pty., Ltd., formerly went only to Mitsui Aluminum Co., Ltd., on a 20-year, 10-million ton (total) contract. In August 1974 another contract was concluded regarding the Gove area to supply Nippon Light Metal with 4.3 million tons in 12 years, and Showa Denko and Sumitomo Chemical each with 1 million tons in 10 years. Alumina from Pinjarra (also owned by Alcoa), amounting to more than 600,000 tons in 1974, went mostly to Mitsubishi Chemical Co.; this project is in the process of substantial expansion and will also supply large tonnages to Amax Aluminum Co., Inc.

Japan has acquired about 2 million tons of bauxite yearly from Bintan, Indonesia, and Johore, Malaysia, in recent years, with the three older companies—NLM, Sumitomo Chemical, and Showa Denko—importing the bulk. Whereas reserves of high-grade bauxite from Malaysia may run out in 5 to 10 years, a new large deposit has been found on Enam Island, Indonesia, where other commercial deposits might also be found. An agreement was finally reached at yearend between five Japanese aluminum companies and the Indonesian Government on the Asahan power-aluminum project to be built at a cost of $830 million. The plan is to produce 75,000 tons of aluminum by 1982; 225,000 tons by 1984; and 360,000 tons at some later date, using Indonesian bauxite.[7] Early in 1975, an agreement was finally reached between five Japanese aluminum companies and Companhia Vale do Rio Doce of Brazil to build a 1.3-million-ton alumina plant and a 640,000-ton aluminum reduction plant in Bira De Conde in Pará State and a 1.85-million-kilowatt hydropower plant in Tucurui on the banks of Tocantins River. This $3 billion project will probably be completed in the early 1980's.[8]

In August Japanese firms were expected to agree to 20% capital participation in the "Venalum" project (down from 80% because of Venezuela's increased oil dollars), together with the Guyana District Development Corp. of Venezuela. The plan is to produce 70,000 tons aluminum annually by 1977 and 280,000 tons by 1979; eventually a total of 160,000 tons will be exported to Showa Denko, Kobe Steel Ltd., Mitsubishi Chemical, and Sumitomo Chemical. In June the Aluminum Resources Development Corp (ARDECO) of Japan, Kaiser Aluminum & Chemical Corporation, and the Government of Ghana agreed to set up a joint venture to produce alumina from local bauxite (600,000 tons of alumina annually) and also 100,000 tons per year of aluminum from reduction plants to be completed in the Tema District by about 1980, if feasibility studies prove successful; the Ghanians will build a 200,000-kilowatt powerplant for this purpose.

Mitsui Mining & Smelting Co., Ltd., together with sister Mitsui companies have reached an agreement with local authorities to consider building a 600,000-ton alumina plant on Rennel Island, Solomon Islands.[9] Bauxite reserves are 30 to 60 million tons. This ore with various impurities will be treated by Mitsui's new technology (not Bayer Process) which raises alumina recovery to 95% and cuts down soda and fuel oil consumption by 50% and 30%, respectively. If a feasibility study proves successful, completion of plant construction should be in 4 years. Aluminium Company of Canada Ltd. (Alcan), and its subsidiary NLM made plans to establish a joint venture to make alumina for conversion into 100,000 tons of aluminum at Alcan's smelter at Kitimat, British Columbia. The Japanese joint venture Bluff Works in New Zealand moved ahead on its plan to expand aluminum capacity to 150,000 tons by mid-1976.

Japan has a sophisticated Bayer processing and aluminum reduction industry, although the high cost of power and energy

[7] Japan Metal Bulletin (Tokyo). Oct. 19, 1974, p. 4 and other pages.
[8] Japan Metal Bulletin (Tokyo). Mar. 25, 1975, pp. 4–5.
[9] Japan Chemical Week (Tokyo). Mar. 6, 1975, p. 1.

is a built-in handicap. Data on raw materials and power consumption reveal Japan's relative competence in production of light metals. During April 1973 to March 1974, 2.19 tons of bauxite, 99 kilograms of caustic soda, and 118 liters of heavy oil were consumed per ton of alumina. For the same period and for each ton of aluminum, consumption of raw materials was as follows, in kilograms: alumina, 1,931; cryolite, 6; recovered cryolite, 22; aluminum fluoride, 36; anodes 537; calcined coke 408; pitch 158; and cathode carbon 8. Power for electrolysis stood at 15,151 kilowatts per ton of aluminum, and power for other than electrolysis, 1,122 kilowatts.[10]

Overall, Japan's alumina production declined from 1,987,144 tons in 1973 to 1,800,859 tons in 1974, with the difference made up by imports from Australia. NLM's output declined from 768,859 tons in 1973 to 666,215 tons; Sumitomo Chemical's output dropped from 567,582 tons in 1973 to 489,185 tons. Showa Denko showed a nominal drop from 469,794 tons in 1973 to 460,254 tons and Mitsui Aluminum showed a nominal gain from 180,909 tons in 1973 to 184,605 tons.[11]

As for performance by individual companies in primary aluminum production, NLM produced 313,237 tons in 1974 as compared with 320,909 tons in 1973; Showa Denko showed a gain to 209,690 tons from 198,755 tons; Sumitomo Chemical produced 273,994 tons as compared with 274,145 tons in 1973; Mitsubishi Chemical showed a gain to 244,552 tons from 224,915 tons; and Mitsui Aluminum's output dropped to 76,901 tons from 78,041 tons.

NLM produced much below its full capacity of 386,000 tons (130,000 tons at the Tomakomai plant; 111,000 tons at the old Kambara plant; and presumably 145,000 tons at the Niigata plant). A 144-cell, 44,000-ton-per-year new potline at Niigata was completed late in the year, but startup might be delayed until September 1975. The idea behind building a joint venture smelter in Kitimat, Canada, was simply to save on energy expense.

Sumitomo Chemical worked its Toyama Works (182,000-tons-per-year capacity) at nearly full scale but scrapped the small and old Kikumoto reduction plant in August, except for the "superpurity aluminum" lines rated at 8,300 tons. The Kikumoto 800,000-tons-per-year alumina plant, however, was kept intact and running. A new 50,000-tons-per-year reduction works at Toyo in Ehime was virtually completed at yearend, with another 50,000-ton-per-year capacity to be added a year later. To take advantage of tax breaks, Toyo is under a wholly–owned subsidiary, Sumitomo Aluminum Smelting Co., Ltd.

Near yearend, Showa Denko discontinued operation of 150 cells (15% of its total of 985 cells) at three of its aluminum smelters, namely Chiba, Kitakata, and Omachi. Chiba has 160,000-tons-per-year of Showa's total 275,000-tons-per-year capacity. Plans to add 50,000-tons-per-year capacity at Chiba have been dropped indefinitely, possibly in favor of building plants abroad. Showa Denko had a good financial year. However, this was mainly attributed to nonaluminum product lines, such as fertilizers, ferrochrome, electrodes, and metals and carbons needed by the iron and steel industry.

Mitsubishi Chemical, which relies on Australia for all its alumina needs, completed its Sakaide Works early in 1975 to make its 190,000-ton-per-year capacity the largest in Japan. The last installment at Sakaide was 128 cells aggregating 50,000-tons-per-year and will be in full-scale operation in July 1975. Meanwhile, the whole works was scheduled to produce at roughly half capacity for the first half of 1975. Mitsubishi's other reduction works, Naoetsu which may be rated at about 150,000-tons-per-year, was worked nearly full scale during 1974 but with periodic repairs moved up so as to cut down only slightly on production.

Mitsui Aluminum moved cautiously toward its goal to produce 400,000-tons-per-year (200,000-tons-per-year already installed) of alumina and correspondingly 162,000-tons-per-year (118,500-tons-per-year already installed) of aluminum. Mitsui Alumina Co., Ltd. a subsidiary, began expansion work at the Wakamatsu Alumina Works with target completion date early in 1976 at a cost of Y17 trillion (including Y2.5 trillion for pollution control equipment). At the Omuta (or Miike) reduction works, 128 cells aggregating 43,500

[10] Japan Metal Bulletin (Tokyo). May 27, 1974, p. 7.
[11] Japan Metal Journal (Tokyo). Feb. 17, 1975, p. 8.

tons were completed at yearend to add to the 75,000-tons-per-year previously installed. The last 43,000-ton-per-year capacity is also targeted for 1976.

**Chromium.**—Japan was involved in all phases of chrome operations. Domestic output of low-grade chromite continued to correspond to a fraction of imports. Ferrochrome production in fiscal 1973–74 totaled 495,000 tons, as compared with 360,000 tons a year earlier. Japan's exports of ferrochrome were 57,578 tons, including 31,359 tons to the United States; imports of ferrochrome were 38,815 tons, predominantly from the Republic of South Africa. All Japanese ferrochrome producers were interested in smelting overseas. Japan also produced 2,146 tons of metallic chromium in 1974. The Tekkosha Co., Ltd. was the main producer and the Chuo Denki Kogyo company was the second producer. Tekkosha's Yamagata plant now rated at 200-tons-per-month was due to be expanded 25% in 1975.

Meanwhile, 1,154,911 tons of high-grade ores were imported in 1974, specifically 423,738 tons from the Republic of South Africa, 310,888 tons from India, 127,033 tons from the Philippines, and 122,650 tons from the U.S.S.R. Japan's five leading ferrochrome producers (Showa Denko, Japan Metals & Chemicals Co., Ltd., Nippon Denko Co., Ltd., Nippon Kohan K.K., and Awamura Metal Industry Co.) took 49% ownership of a joint project with the Brazilian firm Cia. de Ferro Ligas da Bahia S.A. to mine a 100-million-ton ore reserve in Bahia, Brazil. The plan was to produce 100,000 to 200,000 tons of chromite per year initially and 35,000 to 70,000 tons of ferrochrome eventually.

**Copper.**—At yearend 1974, Japan's modern copper smelting industry was in financial difficulty because of over capacity, a sharp decline in copper prices after a steep rise early in the year, radical increases in energy and labor costs, and general lowering of domestic consumption. Plants could not be operated at full capacity or had to be shut down, ore supply contracts had to be renegotiated in terms of both tonnage and price, and inventories accumulated and tied up working capital. The Government's proposed long-term program to stockpile copper and other minerals did not get underway, because of more urgent matters brought about by the overall economic slump. Exports were scaled down on account of criticism overseas that Japanese copper sales were disturbing the world market. Copper producers were asking for Y90 trillion of relief funds from MITI and the Ministry of Finance, but were granted only about one-third of this amount. December production dropped below 80,000 tons for refined primary copper, the first time since April 1974.

Overall, production of primary electrolytic copper at just under a million tons represented a new record and a gain of 5% over 1973 production. The refined metal was extracted from approximately 3,123,600 tons of imported copper concentrate plus about 400,000 tons of domestic concentrate. In 1974 Japan also imported 62,174 tons of blister copper (mainly from Chile, Australia, and the Republic of South Africa); 230,182 tons of refined copper (three-fifths from Zambia and 18% from Chile); and about 46,000 tons of copper and copper alloy scrap (two-thirds from the United States). Although based mainly upon foreign raw materials, Japan's copper refining capacity at yearend 1974 was probably close to 1.2 million tons per annum. Japan retires inefficient facilities as new ones are built so that reported capacities automatically exclude obsolescent facilities.

Nippon Mining far outdistanced Mitsubishi Metal Corporation as Japan's leading refined copper producer during April–September 1974. In this period, production by company was as follows in tons: Nippon Mining, 141,066; Mitsubishi Metal, 106,128; Sumitomo Metal Mining Co. Ltd., 79,066; Mitsui Mining and Smelting, 63,770; Dowa Mining Company Ltd., 61,307; Furukawa Mining Co., Ltd., 36,926; and Toho Zinc Co., Ltd., 6,757. Japan's worsening economic slump in the last quarter of 1974 caused strikes at various copper facilities such as Mitsubishi Metal's Naoshima smelter and Shimokawa mine, Mitsui's Takehara and Tamano smelters, Sumitomo's Sazare mine, and Dowa Mining's Kosaka smelter. Near yearend 1974, Nippon Mining and Mitsubishi Metal worked out arrangements with labor unions to lay off a total of about 4,500 workers at up to 90% pay and to immediately recall these workers when markets recover. The Japanese smelters were also seeking to raise toll charges from about

US$0.08 to US$0.14 per pound to US$0.20 to US$0.23. Capacity details on Japan's copper companies and facilities as of yearend 1973 are shown in the 1973 edition of this chapter.

Near yearend MITI's recommendation to copper producers was an overall production cut of about 20% and the nonferrous industry's hope was a substantial government loan along with a 15% to 30% cut in raw materials from foreign suppliers. Nippon Mining temporarily suspended operations of the No. 1, 10,000-ton-per-month flash smelter at Saganoseki on December 19 while continuing to run the No. 2 flash smelter of the same size and the 7,000-ton-per-month flash smelter at Hitachi; the corresponding refineries were also scheduled to be "compressed." Mitsubishi Metal did not start up its completed 4,000-ton-per-month continuous copper smelter until August; subsequently, a decision was made to temporarily cut down monthly output to the 1,500-ton to 1,600-ton level. The Dowa Mining Company permanently closed down the marginal 1,000-ton-per-month smelter at Okayama and was planning to cut down output at another 3,800-ton-per-month smelter. Consideration was given to reducing Omahama smelter's output by 3,000-tons-per-month at yearend 1974. Furukawa Mining Co. decided to close down the 3,500-ton-per-month Ashio smelter for 10 days beginning December 28.

Operated by the same companies that own the large and modern smelters, Japan's domestic copper mining industry contributed about one-tenth of the primary copper raw material supply required by smelters in 1974. However, production declined 10% below the 1973 level of about 91,000 tons of mine copper. Despite important new findings of the famous, complex black metal or "kuroku" ores, output in 1973-74 was much below the 120,000 tons produced annually a few years back. The trend towards shutting down old mines continued, with various new "kuroku" mines not fully developed taking their place. Nippon Mining's Namariyama mine was readied for production. With additional reserves available from a new ore body, capacity of Mitsubishi Metal's Shimokawa mine was increased to above 10,000 tons of mine copper annually. Mitsubishi Metal brought another "kuroku" mine into full-scale production, namely, Matsuki in Akita Prefecture. It was designed to produce about 5,000 tons of copper per year from 3.7% copper ores (plus 2.8% combined lead-zinc). Dowa Mining's Fukazawa mine, also in Akita, was proving up much more reserves than first thought. Early in 1974, known reserves were about 6 million tons of ore grading 14.7% zinc, 3.0% lead, and 1.1% copper. The eventual target was to produce 240,000 tons of ore annually. During 1974, the Japanese Government announced that in regional drilling of the Hokuroku Kita area, Aomori Prefecture, two intersecting high-grade zones of mineralization were discovered near Lake Towada at a depth of about 1,250 feet. One zone is 16 feet wide analyzing 2.2% copper, 3.0% lead, and 6.2% zinc, and the other is nearly 7 feet wide analyzing 4.8% copper, 2.0% lead, and 3.5% zinc.

Japan was building up to an annual supply of more than a million tons of imported copper-in-concentrate by the latter part of the 1970's. Thereafter, growth in imports of concentrate probably will slow down, because of saturation of domestic smelters and the trend towards constructing smelters abroad and obtaining more copper in form. The Japanese had already signed long-term contracts with Peru and Zambia for substantial imports of blister copper. In 1974, Japanese smelters were jointly investigating erection of an 80,000-ton-per-year copper smelter in the Philippines by the late 1970's, whereby only 10,000 tons would be kept for local consumption and most of the rest exported to Japan. Mitsui Mining and Smelting installed a Mitsui Segregation Process [12] pilot plant for copper oxide ores at the Katanga mine, southern Peru, for subsequent development into a full-scale operation. Mitsubishi Metal started to negotiate with various foreign companies to "export techniques" related to its continuous copper smelting process called "MI process," with a view towards establishing new smelters.

Japan's imports of copper concentrates in 1974 (usually 24% to 29% Cu) showed a 5% increase over the 2.97 million tons imported a year earlier. Canada maintained

[12] Salt and coke added to finely ground 5% Cu oxide copper ores and heated to 650° C to form copper chloride which is reduced to native copper by the coke. Subsequent flotation makes a 53% to 58% copper concentrate.

its position as principal supplier of mine copper to Japan, supplying 1.13 million tons of concentrates in 1974. The Philippines improved its relative position, furnishing 886,000 tons as compared with 763,000 tons in 1973. The Japanese also imported about 381,000 tons of copper concentrates from Bougainville in 1974; 188,000 tons from Australia; 184,000 tons from Chile; 162,000 tons from Indonesia (Freeport Mineral Co.'s Ertzberg mine); and 88,000 tons from Zaire (mainly from the Musosi mine) among the leading suppliers. Since most of the copper mines in these countries were established mainly to supply the Japanese market, the companies involved were anxious to increase sales whereas Japanese smelters, because of the economic slump in Japan, wanted to temporarily reduce supplies. Thus, a great deal of renegotiation of long-term contracts took place in 1974.

At yearend 1974 Japanese copper smelters were paving the road for an international copper conference in London, at which time suppliers again would be asked to cut their copper concentrate shipments to Japan on a temporary basis in view of the large buildup of Japanese inventories. Previously, the Intergovernmental Council of Copper Exporting Countries (CIPEC) had already agreed in principal to reduce overall world shipments to Japan by 10%. By mutual agreement, receipts by Japan from the Bougainville copper mines in Papua New Guinea and Sherritt Gordon mines and Granduc mines in Canada were scheduled to be cut by 15%, 40%, and 50%, respectively. Nippon Mining also asked two British Columbia producers—Gibralter mines and Craigmont mines—to reduce shipments by 15% in December 1974 and in January 1975. In the Philippines, Japan's Mitsubishi Metal, Mitsui Mining and Smelting, and Nippon Mining proposed cuts of 30%, 30%, and 40%, respectively, to Atlas Consolidated Mining and Development Corp., Marinduque Mining & Industrial Corp. and Marcopper Mining Corp. near yearend 1974. No doubt these cuts would be restored once the world economic crisis is over the hump and Japanese smelters can operate normally once more. Indonesia's Ertzberg mine presented no particular problems regarding shipments to Japan, because development and production were behind schedule.

Meanwhile, Japanese nonferrous companies continued to look worldwide for additional copper supplies. Agreement was reached in March between Sumitomo Metal, Dowa Mining, and Mt. Isa of Australia for a joint venture in Papua New Guinea to possibly develop a 400-million-ton, 0.45% copper ore deposit. Another agreement was signed in May between Nippon Mining and Petromin of Saudi Arabia to prospect for high-grade nonferrous resources in the northwestern Nugra District. Mitsubishi Metal was helping to boost production at the Gun Powder mine in Queensland, Australia, from 8,000 to 14,000 tons of mine copper yearly. Marubeni Corp. decided to participate in a joint venture with the French for prospecting copper deposits in the Moba District of Zaire. The Government of Chile asked the Japanese to jointly look into various deposits, including El Abla where 700 million tons of ore have been reported. Rio Branco of Chile, already a large supplier to Japan, asked Japanese firms (Sumitomo Metal, Nippon Mining, and Mitsubishi Metal) for loans to raise production by 40% so that the Japanese would be supplied with 70,000 tons of mine copper annually by 1977. Nippon Mining was also looking into the Cerro Colorado deposit (100 miles east of Iquique) in Chile where estimated reserves are 100 million tons of 1.2% copper ore. In October, nine Japanese firms signed a joint contract with Southern Peru Copper Corp., and advanced $23 million for future deliveries (1977-91) of 30,000 tons of mine copper per year from the Cuajone area. Thus one-fourth of the total output of the Peruvian company would be exported to Japan.

Mitsui Mining and Smelting expected to import several thousand tons of "segregation process" mine copper annually from the Katanga mine in Peru and was prospecting in promising nearby areas as well. The Japanese were in an international consortium called Cobre Panama, S.A., trying to sign an exploration contract with the Panamanian Government to examine a large porphyry copper deposit in the Petaquilla District. The 30,000-ton-per-year Mamut copper mine in Sabah, Malaysia, developed solely to supply the Japanese smelters, was nearing completion at yearend.

**Iron and Steel.**—Despite the energy crisis, sharp inflation, and overall industrial slowdown, Japan's steel production of 117.1 million tons in 1974 was only 1.8% lower than the previous year. Domestic consumption was radically down, but this was somewhat compensated by stronger foreign demand. As the newer and larger furnaces came into production, older and smaller ones were temporarily or permanently shut down.

Japan strengthened its position as the world's third largest steel producer following the Soviet Union and the United States with 136.0 million tons and 132.0 million tons, respectively. Japan continued to be the world's foremost steel exporter, with a record 33.1 million tons during 1974. Raw material imports were also important by world standards, specifically 142 million tons of iron ore, 6.2 million tons of coking coals (by steel industry only), 3.5 million tons of steel scrap, and 1.2 million tons of pig iron. Value of steel exports greatly exceeded imports of raw materials for steelmaking, with the favorable trade balance amounting to approximately $1.5 billion in 1974, excluding liquid fuels.

Japan had 6 of the 10 largest blast furnaces in the world late in 1974, and about 13 of the first 20 blast furnaces. The other four large blasts furnaces were located in France (Usinor No. 4), the Netherlands (Hoogovens No. 7), (Italy–Stell No. 5), and West Germany (August Thyssen No. 1). The present Japanese world leader is Nippon Kokan's Fukuyama No. 5 capable of producing more than 11,000 tons of pig iron per day. In comparison, the largest Soviet furnace is rated at 3,200 cubic meters and the largest U.S. furnace at less than 2,500 cubic meters. Apparently, no new Japanese blast furnaces were brought in during 1974. As of yearend 1974, Japan's 10 largest blast furnaces follow:

| Company and blast furnace | Cubic meters | Startup date |
|---|---|---|
| Nippon Kokan's Fukuyama Works No. 5 | 4,617 | November 1973. |
| Kawasaki Steel's Mizushima Works No. 4 | 4,323 | April 1973. |
| Nippon Kokan's Fukuyama Works No. 4 | 4,197 | April 1971. |
| Nippon Steel's Oita Works No. 1 | 4,158 | April 1972. |
| Sumitomo's Kashima Works No. 2 | 4,080 | March 1973. |
| Nippon Steel's Kimitsu Works No. 3 | 4,063 | September 1971. |
| Kobe Steel's Kagogawa Works No. 2 | 3,850 | January 1973. |
| Nippon Steel Yawata Works Tobata No. 4 | 3,799 | June 1972. |
| Kawasaki Steel's Mizushima Works No. 3 | 3,367 | October 1970. |
| Sumitomo's Kashima Works No. 1 | 3,159 | January 1971. |

Four Japanese steel companies were among the world's top 10 in 1974, headed by Nippon Steel Corporation with output of about 38.5 million tons. This compares with the 30.8 million tons produced by the United States Steel Corp.; the 20.2 million tons by the Bethlehem Steel Corp.; and the 19.3 million tons by the British Steel Corp., the next three ranking steel firms. August Thyssen with 16.7 million tons was fifth, followed by Japan's Nippon Kokan with 16.2 million tons; Kawasaki Steel Corp. with 14.9 million tons; and Sumitomo Metal Industries, Ltd., with 14.6 million tons. Italy's Finsider Enterprises with 13.6 million tons and the Netherlands-West German joint venture ESTEL with 12.0 million tons rounded out the first 10 companies.[13]

As of yearend 1974 Japan had three steel bases with an annual steel capacity of 10 million to 15 million tons—Nippon Kokan's Fukuyama Works, Nippon Steel's Yawata Works (Tobbata is a subsection), and Kawasaki Steel's Mizushima Works, in that order. There were three other slightly smaller bases — Sumitomo's Wakayama Works, Sumitomo's Kashima Works, and Nippon Steel's Kimitsu Works. Japan's planners felt that the existing national steel capacity of approximately 140 million tons will not be adequate in a few years time. Accordingly, MITI at yearend 1974 approved total steel equipment investments of more than 1 trillion yen for fiscal year 1975, up 30% over those of fiscal year

[13] Japan Metal Bulletin (Tokyo). Mar. 13, 1975, p. 4.

1974.[14] Major construction projects to be completed within 2 years include Kawasaki Steel's Chiba Works No. 6 blast furnace (4,500 cubic meters), Sumitomo's Kashima Works No. 3 blast furnace (5,000 cubic meters), Nippon Steel's Oita Works No. 2 blast furnace (5,000 cubic meters), Nippon Steel's Kimitsu Works No. 4 blast furnace (4,500 cubic meters), and Kobe Steel's Kakogawa Works' No. 3 blast furnace (4,500 cubic meters).

In conjunction with producing a reported 117.1 million tons of crude steel in calendar 1974, Japan also produced 90.4 million tons of pig iron, 91.0 million tons of hot-rolled ordinary steel, and 9.3 million tons of hot-rolled special steel. The high ratio of pig to steel shows the importance of iron ore and large blast furnaces to the industry. Breakdown of Japan's crude steel output in 1974 was as follows, in million tons: Basic oxygen furnaces—94.7; electric furnaces—20.9; and open-hearth furnaces—1.5.

The energy crisis has motivated Japan to further improve steel technology. All major companies have initiated programs to conserve energy. Conversion from open-hearth to basic-oxygen furnaces and greater efficiency in coking coal usage have already meant substantial savings. The new directions include recovery of energy from red coke, greater use of waste gas from hot stoves, and applying top pressures in blast furnaces. Research is also being done on hot briqueted coal, formed coke, and non-fired agglomerate ore. Nippon Steel has led the way in the use of noncoking coal to cut down consumption of hard coking coal.[15] A briquet production facility for this purpose has already been installed at the Yawata Works and a second facility is planned. Plans for utilization of nuclear energy in steelmaking moved ahead towards development of a pilot plant after 1979.[16] The initial objective was to build a multi-purpose, high-temperature, gas-cooled experimental reactor. The Japanese steel companies have also made significant progress in continuous-casting technology and marine engineering. In mid-1974, Nippon Steel decided to begin construction of a 150,000-ton direct-reduction iron plant at the Hirohata Works that could utilize liquefied natural gas (LNG), heavy oil, or coal gas as the reducing agent.

The importance of exports to Japan's steel industry is such that up to one-third of the steel products output in recent years have been exported. The 33.1 million metric tons exported in 1974 was a new record, up 30% in quantity and 102% in value over 1973 quantity and value. Asia stood first on the list of destinations in 1974, but the United States was still by far the most important single recipient country, with exports totaling 6.5 million tons. Next came the People's Republic of China (PRC), with Japanese steel exports at 2.9 million tons. Regionally, Asia accounted for 14.2 million tons in 1974; North America, 7.4 million tons; Europe, 4.5 million tons; and South America, 4.4 million tons. The most important steel products exported were wide hoops, cold-rolled steel, plates, angles, bars, and wire rod, in that order.

Japan's many large integrated steel bases depend upon a steady, long-term supply of high-grade foreign raw materials and this has made the country the world's number one iron ore importer and a leading iron shipper. During 1974, Japan imported 142 million tons of iron ore, as compared with 135 million tons in 1973. The pattern of imports by country show that nearly half came from Australia, one-sixth from Brazil, one-eight from India, and about one-tenth from Peru and Chile combined. Iron ore requirements by major steel producers during 1974 show Nippon Steel at more than 55 million tons; Nippon Kokan, Kawasaki Steel, and Sumitomo Metal at 18 million to 22 million tons each; and Kobe Steel at just over 10 million tons.

Japan has had no difficulty acquiring adequate quantities of iron ore because of its long-term direct and indirect efforts in promoting iron ore production and transportation worldwide. Imports have been limited by what Japan can consume and stockpile at a given time and place. However, economic, political, and technological factors at home and abroad greatly affect the sources of supply, delivery schedules, prices, freight rates, and the nature of the iron and other raw materials imported. The overall impact of the world energy and economic crisis of 1974 has simply been

[14] Japan Metal Bulletin (Tokyo). Feb. 15, 1975, p. 5.
[15] Nippon Steel News (Tokyo). Nippon Steel Corp., No. 57, January 1975, p. 2.
[16] Nippon Steel News (Tokyo). Nippon Steel Corp., No. 49, May 1974, pp. 1–2.

much higher unit c.i.f. landed prices, with iron ore increasing by nearly one-third and coal roughly doubling. However, unit steel price for exports rose about 55% during the year, thus compensating for the expensive raw materials. At yearend 1974, stocks of both iron ore and coal were equivalent to more than a 1.3-month requirement. These stocks were much higher than usual and Japanese steelmakers were predicting an oversupply situation for raw materials during most of 1975.

Australian iron ore prices were renegotiated several times during 1974. In September, a 22% f.o.b. price increase to about US$12.30 per ton was agreed upon, covering the period September 1974 to March 1975. For contracts to be reviewed after March 1975, another 7.5% price increase would be allowed. Shipping costs have vacillated greatly in the past, and this means that Japan's iron costs from Australia, the leading supplier, will be $120 million to $200 million higher in the coming year than in 1974. India, an example of a medium-size supplier, furnishes Japan with nearly 10 million tons of iron ore per year, and the latest f.o.b. price of "base grade" iron ore ranged from about US$13.05 to US$14.15.

Japanese steelmakers consume sizable tonnages of iron and steel scrap, although proportionally not as much as U.S. steelmakers because of the preponderance of integrated blast furnace-converter operations. The Japanese Iron and Steel Federation reported that 46.1 million tons were consumed in 1974 as compared with 48.6 million tons in 1973. Recirculated plant scrap from domestic operations is the principal constituent; however, imports have been important from time to time. During 1974 steel scrap imports by Japan totaled 3.5 million tons as compared with 5.4 million tons in 1973. Price and availability of scrap greatly affect the use of foreign scrap.

During 1974, Japanese steelmakers consumed about 57 million tons of imported coking coal and 9 million tons of domestic weakly caking coal. The United States and Australia continued to be the Japan's principal coal suppliers, with U.S. coal commanding higher prices because of superior quality. For further discussion of this subject, see section under Coal.

Japan has been increasingly involved in iron and steel projects abroad because of interest in raw materials, proficiency in steel technology, desire to extend technical and financial assistance, and business and shipping advantages. For example, Nippon Steel was involved in a joint 10-million-ton steel venture with Broken Hill Pty. and Jones & Laughlin Steel Corp. to build an integrated plant somewhere in Western Australia. The Pohang Iron & Steel Co., Ltd. of the Republic of Korea (South) asked the Japanese Government in mid-1974 to help plan a third expansion program to raise crude steel output from the present 1,200,000 tons annually (second stage of 2,600,000 tons already decided upon) to 8,500,000 tons. The Brazilians and Japanese are in a joint venture to build a 12-million-ton steel center in the Itaqui area in conjunction with a program to deliver iron ore to Japan. Another 6-million-ton project was being implemented in the Tubarão area of Brazil. The Japanese have been asked to look into a 4-million-ton integrated steel plant at San Nicolas Port and a 1.2-million-ton direct reduction plant south of Tahara City, both in Peru. A 3.5-million-ton direct reduction plant will be built in Al Jubayl, Saudi Arabia, in cooperation with Marcona Corp. A 3-million-ton steel plant was scheduled to be built eventually on the Coast of Saldanha Bay, the Republic of South Africa. The Japanese were also either already involved or bidding for additional projects in Australia (Kwinana), Egypt (Alexandria), Mexico (Las Truchas), Venezuela, Iran, Nigeria, the Philippines (Luzon), Indonesia (Merak), India, and recently even in British Columbia, Canada.

**Lead and Zinc.**—Japan has been a much more significant world producer of zinc than of lead, both in terms of domestic mine production and refined metal output, the latter being based primarily on imported raw materials. Local zinc-lead ores contain more zinc than lead. Imports of zinc concentrate have also been much larger than imports of lead concentrate. Nonetheless, the country's indigenous output of both metals constituted on the order of one-fourth to one-third of the total supply of primary raw materials during 1972–74, indicating that Japan is of some consequence as a mine zinc and lead producer by international standards. In slab zinc output, Japan ranked first in the world since 1972, surpassing the U.S.S.R., the

United States, and Canada by sizable tonnages. Within a few years, the country's annual zinc metal production should top the 1-million-ton plateau.

Meanwhile, Japan's zinc-lead industry was encountering financial difficulties, especially during the latter part of the year, mainly on account of slackening domestic demand and impending further cuts by major consumers such as galvanizers. The zinc smelters had already reduced output by 10% to 20% in December, and proposed cuts for January 1975 would be 25% to 40% of designed capacity. Corresponding figures for lead smelters were 10% to 12% in December and 20% to 38% in January. On an annual basis the business slump was not so obvious, since production of both metals were at about the same levels as in 1973. Also, as of April 1974, Japan's zinc smelting capacity was 908,000 tons per year and rate of operation was 96%; and lead smelting capacity was 258,000 tons and rate of operation was 90%.

Earlier in the year, while the domestic market sagged, export orders bolstered Japan's zinc and lead smelters. Zinc orders from the United States, which accounted for nearly half of the approximately 116,000 tons exported, all but stopped in January 1975. Lead exports amounted to about 33,000 tons (about 10,000 tons to Canada, 7,000 tons to the U.S.S.R., and 4,000 tons to the United Kingdom). Mitsubishi Metal was temporarily staving off production cuts by shipping pig lead to its affiliate Cominco Ltd., of Canada; stocks, however, rose to unmanageable levels by yearend. Lead smelters were hoping that shipments to the U.S.S.R. would pickup.

Whereas metal sales slumped, and this led to worldwide renegotiations on raw material supply, zinc smelters still had to have enough ore for smelting. Strangely, there was some apprehension at yearend about having enough concentrates to smelt in the coming year. The Australians notified the Japanese that they intended to cut supplies by 20% to 30% beginning January 1975, so as to save more for their own domestic industries. Some Japanese facilities are custom or toll smelters, and supply and demand imbalances are part of the smelter business.

Domestic mines were not significantly affected by the economy and world situation. At Japan's premium zinc mine—Kamioka in Gifu Prefecture owned by Mitsui Mining and Smelting—rich ore beds containing 11% zinc were recently encountered in the lower portions of the Mozumi pit. The new find should add much to the approximately 12 million tons of 7.7% zinc ore already delineated at Mozumi, where daily output will soon be pushed up to 2,000 tons of ore or about 150 tons of mine zinc. Dowa Mining was in the process of expanding the new Fukazawa "black ore" mine near Odate from 11,000 to 20,000 tons of mine-run ore per month (about 12% Zn). Nippon Mining's Shakanai "black ore" mine produced about 400,000 tons of complex metal ores in 1974, containing about 15,000 tons of zinc. Development continued at Nippon Mining's Namariyama mine and prospects known as Toyoha (Hokkaido) and Nakanogewa. Mitsubishi Metal was building up the Matsuki mine in Akita Prefecture to produce annually several thousand tons each of copper and zinc.

Japan has been producing between 240,000 and 295,000 tons of mine zinc annually (or 450,000 to 550,000 tons of zinc concentrates) during most of the last decade, which represented about 5% of the world's output. A steady decline has taken place since the peak in 1971, with production in 1974 about 9% lower than the approximately 264,000 tons produced in 1973. Some older mines have been shutdown, and many of the "black ore" mines have not yet been fully developed. Further declines in Japan's mine zinc production are not anticipated.

Imports of zinc concentrate rose slightly from 1,205,405 tons in 1973 to 1,215,879 tons in 1974. Converting at about 54% zinc in concentrates, Japan's imports in each of these 2 years was about 650,000 tons of contained zinc. In 1974, Canada supplied about 31% of Japan's zinc concentrate imports and was followed by Peru with 26% and Australia with 19%; the Republic of Korea, the United States, North Korea, Mexico, Bolivia, and Honduras furnished a large part of the remainder. Unlike imports of iron ore and copper, most of the zinc concentrate obtained abroad was from established producers rather than from new mines developed for the Japanese market.

Japan was becoming increasingly involved in foreign mine projects. For exam-

ple, at the Huanzala mine in Peru, Mitsui Mining and Smelting's subsidiary Hachinoe Smelting was instrumental in raising the mine's yearly output to 30,000 tons of mine zinc and 10,000 tons of mine lead through an advance of funds amounting to over $3 million for mill expansion. Toho Zinc with a Canadian partner started on the second stage of prospecting at the Minorsa lead-zinc mine in Guatemala. Mitsubishi Metal was moving ahead on a scheme with American and Canadian partners to explore and develop various deposits in Yukon Territory, especially the MacMillan region. The Dowa Mining agreed to extend to the New Jersey Zinc Co. (subsidiary of Getty Oil Co.) a $3.5 million loan for the development of the Huari Huari "high-silver" zinc mine in central Bolivia, with a view towards obtaining 50,000 tons of zinc concentrate annually beginning mid-1976. Sumitomo, Mitsubishi, Mitsui, and Dowa agreed to take a combined 10% equity in a $250 million zinc project in east Tennessee (on the Cumberland River) with New Jersey Zinc Co. in return for as much as 40% of the future output of 160,000 tons per year. Investigation of oxide zinc ores in Australia and Iran continued. Agreement was reached between Toho Zinc and Eiho Trading Co., Ltd., of the Republic of Korea to build an $80 million, 80,000-ton-per year zinc smelter in the Onsan area north of Pusan for startup by 1979. Toho will supply half the primary zinc raw material, and part of the output will be sold elsewhere in the Far East.

Japan's mine output of lead also declined in line with reduced zinc output and despite the partial development of the "black ores." Production was about 15% lower than the 52,889 tons of mine lead reportedly produced in 1973. This compares with imports of lead concentrates[17] of 198,948 tons in 1972, 242,753 tons in 1973, and 217,568 tons in 1974. Two-thirds of the above concentrates came from Canada, and the rest mainly from Peru, Australia, and the Republic of Korea.

Mitsui Mining and Smelting, the largest metallic zinc producer in the world, has four smelters: Kamioka rated at 5,300 tons-per-month; Miike at 11,400-tons-per-month; Hikoshima at 7,000-tons-per-month and Hachinohe which belongs to a subsidiary of Mitsui at 6,300-tons-per-month. Thus, the total for the company is 30,000-tons-per-month. The plan was to cut down production by about 30% during the spring quarter of 1975. At Kamioka, zinc operations will be totally suspended for the last 3 weeks of February 1975 because of the short supply of power during the dry seasons. At Miike, the relatively small electrolytic zinc plant was scrapped at yearend and one-fourth of the 32 vertical retorts will be shut down. On the other hand, Kamioka's lead refining capacity was scheduled to be raised to 2,250-tons-per-month, so that 450-tons-per-month of crude bullion need no longer be sent to the company's Takehara lead refinery. Construction began on a fluosolids zinc roster at Kamoika and a zinc oxide plant at Miike.[18] The concept would be to temporarily cut output up to 30% across the board for the other facilities. The Hachinohe (or Hachinoe) Imperial Smelting Process (ISP) plant is rated at about 37,000 tons of lead and 78,000 tons of zinc yearly.

Because of "cadmium-pollution" difficulties, the working capacity of Annaka, formerly Japan's largest zinc smelter, has been cut down to 11,600-tons-per-month by MITI. Meanwhile, capacity of the Iijima electrolytic smelter of Akita Zinc Co. (subsidiary of Dowa Mining) was doubled to 13,000-tons-per-month by August with production rate near the turn of the year at about 11,000 tons. Earlier in the year Dowa mining started to build a 2,000-ton-per-month lead smelter and a 2,500-ton-per-month lead refinery at Kosaka, Akita Prefecture. Mitsubishi Metal was considering at yearend to cut output at the 7,500-ton-per-month Akita zinc smelter by up to 25%; meanwhile its subsidiary Mitsubishi Cominco Co. practically decided upon a 50% cut for its 3,000-ton-per-month lead smelter at Naoshima. Nippon Mining with some 10,000-tons-per-month zinc capacity and 3,000-tons-per-month lead capacity at its Saganoseki refinery was talking about raising cuts from 20% to 40%, and Sumitomo Metal with some 4,600-tons-per-month zinc capacity was considering raising cuts from 15% to 25%. Sumiko I.S.P., Sumitomo's subsidiary with a plant at Harima, was producing about 4,500-tons-per-month of distilled zinc and 1,500-tons-per-

[17] Japanese lead concentrates are 53% to 58% lead, whereas imported concentrates are generally better than 60% lead.

[18] Japan Metal Bulletin (Tokyo). Nov. 2, 1974, p. 4.

month of lead near yearend. Toho Zinc was planning to raise cuts from 12% to 20% at its 6,000-ton-per-month Chigirishima lead refinery.

**Magnesium.**—Japan's primary magnesium production, furnished entirely by Furukawa Magnesium Co., Ltd. and Ube Industries, Ltd., was only 8,923 tons, down about 21% as compared with production in 1973 and in 1972. Secondary magnesium production increased from 8,107 tons in 1973 to 10,877 tons in 1974, reflecting the higher level of titanium production which recycles most of the magnesium. Imports of magnesium and alloy ingots rose to 13,426 tons (1974 exports 1,461 tons), more than doubling the 1973 tonnage. Overall magnesium consumption in 1974 was about 24,700 tons, including 11,200 tons in titanium and zirconium smelting, 5,400 tons for light-metal rolling, 3,400 tons for aluminum alloys, and 1,272 tons for nodular cast iron.[19]

In April, Showa Denko decided to launch magnesium production with its own technology at the Chichibu Works. The process is claimed to be pollution-free, dry, and completely automated, requiring only 40 workers for producing 10,000-tons-per-year. A 200-ton-per-year pilot plant was being constructed, and this will be scaled up to 2,000 tons in 1975 before building a full-scale, 10,000-ton-per-year plant.[20]

**Manganese.**—Although Japan produces several hundred thousand tons of low-grade manganese annually, virtually all requirements for high-grade manganese ores have been met by imports. In 1974, imports of high-grade manganese ore amounted to 1.876 million tons (1.786 million tons in 1973), with Australia and the Republic of South Africa each supplying about 35% and Gabon 7%. Groote Eylandt Mining Co., Pty., Ltd., and Longreach Manganese Pty., Ltd., in Australia; South African Manganese Ltd. in Cape Province; and Compagnie Minière de l'Ogooue of Gabon were the main suppliers. Groote Eylandt was closed most of November because of a strike, and the Australians were pressing for a 50% hike in prices to $58 per ton f.o.b. The South Africans were considering asking for a 20% price increase, and Gabon was uncertain about deliveries in 1975. About 2.0 million tons of ferruginous manganese ore, used for charging directly into blast furnaces, was also imported in 1974; the supply came mainly from the Republic of South Africa (50%) and India (41%). The Indians were planning cutbacks in shipments to Japan. Meanwhile, Japanese ferromanganese producers decided to extend a $12 million loan to develop the Tambas manganese mine in Haute Volta for eventual annual shipments of 275,000 to 450,000 tons to Japan.[21]

During 1971–74 Japan produced 500,000 to 700,000 tons of ferromanganese per year, mostly high-carbon type, and 300,000 to 400,000 tons of silicomanganese per year. Exports are far less important than previously. During 1974, 54,265 tons of ferromanganese and 36,002 tons of silicomanganese were exported. In recent years production has been mainly geared to the expanding needs of the Japanese steel industry. Japan Metals & Chemicals Co., Nippon Denko, Nippon Kokan K.K., Chuo Denko Kogyo, Kobe Steel, Ltd., and Mizushima Ferroalloy Co., Ltd. were the principal ferromanganese producers.

Japan ranked second to the United States as a producer of electrolytic manganese and manganese dioxide. Respective annual capacities total just over 14,000 and 40,000 tons. Output in 1974 was 8,659 tons of electrolytic manganese and 44,790 tons of manganese dioxide, as compared with 10,080 tons and 37,501 tons, respectively, in 1973. During the year, Tekkosha Co. produced most of the electrolytic manganese and more than half of the manganese dioxide. The second and much smaller producer of electrolytic manganese was Chuo Denko Kogyo. Mitsui Mining and Smelting produced about two-fifths of the manganese dioxide and Daiichi Carbon the rest. Virtually all the manganese oxide was exported (35,527 tons in 1974 to many different countries), and this explains why Tekkosha and Mitsui Mining and Smelting were looking for plant sites abroad. Tekkosha was on schedule with a 12,000-ton-per-year manganese dioxide project, jointly with Mitsubishi Corporation which has 35% minority interest, in Saronikos (Greece) for startup in the spring of 1975. Mitsui Mining and Smelting was building a similar-size manganese dioxide plant at

[19] Japan Metal Journal (Tokyo). Apr. 7, 1975, pp. 7–8.
[20] Japan Metal Bulletin (Tokyo). May 2, 1974, pp. 4–5.
[21] Japan Metal Bulletin (Tokyo). Feb. 1, 1975, p. 4.

Cork, Ireland, for completion by the summer of 1975. Tekkosha and Nihon Kagaku Sangyo Co., Ltd. were moving ahead on plans to produce refined manganese dioxide ($Mn_3O_4$) for use as raw material to make high-purity ferrite.

**Molybdenum.**—Japan imported 17,111 tons of roasted molybdenum concentrates in 1974—9,216 tons from the United States, 5,727 tons from Canada, 2,019 tons from Chile, and 149 tons from other countries. In addition, 667 tons of unroasted concentrates were imported. In 1973, total imports were only 16,613 tons. Indigenous ore production has always been nominal and Japan decided to abolish the tariff on imports. Japan also imports much ferromolybdenum—2,292 tons in 1973 and 2,172 tons in 1974—to supplement the 2,000 to 3,000 tons of ferromolybdenum produced annually in recent years. During 1974, Japan produced 341 tons of molybdenum powder and imported 80 tons, down respectively 30% and 59% from 1973 figures.

The American Metal Climax Co. (AMAX), by far the principal individual supplier, formed a joint venture (34% AMAX) with 10 Japanese ferroalloy producers by the name of Japan Molybdenum Co. to build a 9,000-ton-per-year molybdenum trioxide plant, hoping to produce more than half of Japan's need for molybdenum trioxide. However, because of the recession, the plan was not yet implemented by yearend. AMAX has a subsidiary (AMAX Japan Co., Ltd.) to handle all of Japan's import business originating from AMAX enterprises including U.S. molybdenum materials, copper from various sources, Australian iron ore, and large quantities of nonferrous ores.

**Nickel.**—For lack of indigenous resources, Japan imports all of its nickel needs. During 1974, 16,298 metric tons of nickel metal (4,756 tons from the U.S.S.R., 3,641 tons from Canada, 3,380 tons from the Republic of South Africa, and 2,402 tons from Norway); 4.218 million tons (3,539 million in 1973) of 1.8% to 2.5% nickel ore (3,363 million from New Caledonia and 0.793 million from Indonesia); 39,780 tons (30,391 tons in 1973) of nickel matte and speiss (17,493 tons from Australia, 17,076 tons from Canada and 5,211 tons from New Caledonia); and 18,001 tons of ferronickel (9,897 tons from Canada) were imported. From these raw materials, Japan produced 20,992 tons of nickel and 73,727 tons of nickel contained in ferronickel in 1974. Japan also imported 2,581 tons of semifabricated nickel and alloy products and 366 tons of nickel alloy ingots. Production of nickel metal dropped 3%, and ferronickel output went up 28%. Japan has a 13% tariff on imported nickel ingots, but ores are not subject to tariff.

Although ferronickel production rose sharply, sales increased only 6% over those of 1973 and, as in the past, went predominantly to the special steel sector. Pacific Metals Co. Ltd., Nippon Yakin Kogyo Co., Ltd., Nippon Mining Co., Sumitomo Metal Mining Co. and Shimura Kako Co., Ltd. were the five companies (with six plants) producing ferronickel in Japan during 1974 and their combined annual capacity totaled about 100,000 tons of nickel in ferronickel. Exports of ferronickel were only 2,274 tons in 1974.

Measured in quantity of contained nickel, ferronickel supply is usually 2 to 3 times as important as nickel metal. However, nickel as metal is used in much more diversified areas. MITI estimates for fiscal year 1974 consumption was 10,700 tons in steel manufacture, 8,400 tons in plating, 2,700 tons in brass products, 1,800 tons in electric machines and appliances, 1,400 tons in coinage and nonferrous alloys, and 2,700 in miscellaneous consumption. Stocks at yearend were about 11,000 tons. As of 1974, Japan possessed two nickel refineries totaling about 21,000 tons in capacity—Sumitomo Metal Mining's Niihama plant and Shimura Kako's Tokyo plant–and two nickel oxide plants—Tokyo Nickel Co. Ltd.'s Matzusaka plant and Nippon Nickel Co.'s Tsuruga plant. Early in 1974 Nippon Nickel announced plans to build a nickel plant of 3,000- to 5,000-ton-per-year capacity at its Tsuruga site. Nippon Mining was also considering producing 3,000 tons of nickel and 1,000 tons of cobalt annually at its Hitachi copper smelter by 1975 to process Australian sulfides. Shimura Kako's plans to raise capacity of its Tokyo plant from 600 to 1,000 tons monthly, and Sumitomo Metal Mining's plans to scale up its Niihama plant from 1,500 to 2,000 tons of nickel per month by adopting the fire-refining process, had not yet materialized at yearend. Meanwhile, Sumitomo was seri-

ously considering closing down its Shisakajima smelter (near Niihama) and using imported Australian matte entirely. In 1974, Australia (mainly Western Mining Corporation, Ltd.) supplied Sumitomo with about 14,000 tons of contained nickel—half in ore and half in matte.

Japanese imports of lateritic nickel ore from New Caledonia increased about 23.5% during 1974 over those of 1973. However, Japanese ferroalloy producers were negotiating early in 1975 to cutback ore imports from this source 40% to 2 million tons in fiscal year 1975, because of their proposed 35% reduction of future output. Meanwhile, in September 1974, a 10-year basic agreement with Rio Tuba Nickel Mining Co. of the Philippines was signed by Pacific Metals Co. to import up to 500,000 tons of ore annually beginning in 1976 from its mine on Palawan Island. To accommodate this development, Pacific Metals was planning to raise its annual ferronickel capacity from 32,000 (nickel content) to 50,000 tons.

Another project in the Philippines which will sell to the Japanese is Marinduque's enterprise on Nonoc Island, Suragao. The refinery is designed to process 3.85 million tons of ore annually into 68.4 million pounds of pure nickel plus mixed sulfide concentrates containing about 6.6 million pounds of nickel and 3.3 million pounds of cobalt. Sumitomo Metal Mining has been building a refinery unit at Niihama to convert the concentrate into the two metals and will receive Nonoc ore under a 7-year contract. It also holds a long-term contract to market 6.7 to 13.4 million pounds of nickel powder or briquets within Japan each year. This Philippine plant went onstream in December 1974.

Japanese nickel interests in Indonesia were in more than one area of activity. The 1974 and earlier relationship consisted mainly of imports of nickeliferous ores from Sulawesi (Celebes); subsequently, Japanese ferroalloy producers requested that Indonesia's ore supply to Japan be cut down to about 700,000 tons in fiscal year 1975. Furthermore, International Nickel Co.'s subsidiary at Soroako, also on Sulawesi, was expected to put a plant onstream by mid-1976. To begin with, this plant was to produce 35 million pounds of nickel per year, in 75% grade nickel matte, and eventually a 90-million-pound-per-year production was planned. Under a 15-year contract, the entire output of nickel matte will go to Japan for processing.

**Tin.**—Japan's 1974 tin consumption was second only to that of the United States and ahead of the Soviet Union. As in other industrialized countries, by far the most important areas of tin use have been in tinplating and soldering. Japan's own production of mine tin was disappearing, with imminent closure of the only two mines—Akenobe and Ikuno—both belonging to Mitsubishi Metal Corp. which also owns the country's small and only tin smelter at Ikuno. Over 95% of the tin is imported as refined tin. Malaysia provided 19,255 metric tons (1 metric ton equals 0.9842 long tons) out of a total of 31,163 tons of refined tin imported by Japan in 1974; Thailand, 4,674 tons; Indonesia, 5,924 tons; and the potentially important PRC, 830 tons. In 1973, overall imports were 35,816 metric tons. Japan produced 99 tons of tin in November 1974 and 115 tons in December.

**Titanium.**—Demand for Japanese sponge titanium has taken a sharp upturn for more than a year, mainly because of remodeling of petrochemical and caustic soda plants for pollution control purposes, for use as condensors in electric powerplants, and for equipment used in desalting plants. This explains why production went up sharply again in 1974, despite a government cut in electric power supply in the first half of the year. During the second half of 1974, monthly sponge output was more than 800 tons. With consumption controls on oil and power removed, the Japanese titanium industry was hopeful that the 1975 output would reach 10,000 tons. Exports (mainly to the United States) increased from 2,264 tons in 1973 to 2,892 tons in 1974 with overseas demand brisk all year long. With production much higher than the 2,100 tons in 1973 and exports rising 45% to reach 736 tons in 1974, the titanium fabrication business also improved. Japanese titanium producers had a price problem during 1974, with costs up sharply and consumers reluctant to agree to higher prices.

Japan's well established titanium and titania industries have no operational difficulties when demand is strong. In sponge titanium, Osaka Titanium Co. and Toho Titanium Co., Ltd. each has a monthly

capacity of 450 tons, and New Metals Industries Co. (subsidiary of Nippon Soda Co., Ltd.) has another 180-ton capacity.[22] Fabricators were Kobe Steel Ltd., Nippon Mining Co., Nippon Stainless Steel Co., and Furukawa Metal Co.

Japan has also been prominent as a world producer and exporter of titania and synthetic rutile, using about 0.5 million tons of ilmenite yearly as raw material. However, the titania industry was hit hard by sluggish domestic and foreign demand in 1974 which caused curtailment of production by 50% since November. Built-up inventories had reached 25,000 tons by late January 1975. There were six titania producers capable of producing together about 180,000 tons of titania yearly. The group was headed by Ishihara Sangyo Kaisha, Ltd., and Sakai Chemical Industry Co. Ltd. Ishihara had plans to expand titania capacity by 3,000 tons monthly (chlorine process) with a proposed startup by 1975. In addition, the company also has a 40,000-ton-per-year synthetic rutile plant at Yokkaichi, using ilmenite as raw material, and has contracts to ship most of its output to the United States. Ishihara together with C. Itoh & Co., Ltd. have signed contracts to participate in a joint venture in Brazil[23] to produce titania and intermediate material from ilmenite and anatase. Sakai Chemical in joint venture with Toyo Soda decided to construct a 32,000-ton titania facility at Nanyo (Yamaguchi Prefecture), also using the Kerr-McGee chlorine process. Mitsubishi Metal Corporation after succeeding in upgrading ilmenite to synthetic rutile was negotiating with a U.S. ilmenite producer to manufacture 5,000 to 6,000 tons per year of synthetic rutile in the United States. Mitsubishi also has an understanding to sell the synthetic rutile it produces within Japan to the Sakai joint venture now taking shape.

**Tungsten.**—Japan produced only 940 tons (898 tons in 1972) of tungsten-in-con centrates in 1973 and slightly less in 1974. Imports measured in gross weight of concentrates totaled 3,818 tons in 1974 and 4,563 tons in 1973. Awamura Metal Industry Co. continued to be the only important domestic ore producer. The Republic of Korea furnished 1,161 tons of the 1974 tungsten concentrate imports; Portugal, 499 tons; Thailand, 494 tons; Canada, 386 tons; Australia, 274 tons; Peru, 484 tons; and the PRC, 288 tons. Hoping for stabilized imports of Chinese tungsten, a mission was sent there to negotiate for 800 tons annually on a long-term basis.

Awamura was the sole Japanese ferrotungsten producer. Production in 1973 was only 934 tons, which turned out to be 158 tons higher than in 1974. Imports in 1974 were only 231 tons (194 from Portugal), but the figure for 1973 was 598 tons. The three producers of powdered tungsten were Japan New Metals, Nakahara Construction, and Japan Heavy Metals. Their combined output in 1973 was 2,020 tons, 300 to 400 tons higher than in 1974. In addition, 285 tons of tungsten powder were imported in 1974, mainly from the United States, West Germany, and France. Overall demand for tungsten was slightly weaker. Roughly 40% of the 1974 tungsten supply went to steelmaking, 35% to electronics (wire rod and sheet), and 30% to tungsten carbide tools.

**Uranium.**—Japan's ambitious plans to diversify its energy sources away from imported oil to atomic power have hit serious setbacks.[24] Of Japan's eight nuclear reactors, which have a total power-generative capacity of nearly 4 million kilowatts, only two were functioning properly near yearend and six had to be halted for prolonged tests and repairs. Additional projected power projects could very well be delayed and some might be even abandoned. The previously set MITI long-term goal of developing as much as 60 million kilowatts of total nuclear generating capacity by 1985 may have to be cut in half. Safe disposal of radioactive waste, sharp rises in raw materials and atomic power equipment, finding new sites for plants, and cracks and flaws in steam generator tubes and fuel rod cases, plus public indignation and concern, have compounded the difficulties. Environmentalists were threatening to block the start of four new reactors, with a combined capacity of 2.7 million kilowatts, scheduled to go into operation during the first half of 1975.

Before the recent serious turn of events, the Japanese had been investigating all

[22] Plant sites are: Osaka Titanium—Amagasaki in Kyogo; Toho Titanium—Chigasaki in Kanagawa; and New Metals—Nihongi in Niigata.

[23] Japan Chemical Week (Tokyo). Nov. 29, 1973, p. 5.

[24] Far Eastern Economic Review (Hong Kong). Turning Off Nuclear Power. Apr. 11, 1975, pp. 33–34.

kinds of reactors, materials, advanced methods, and international arrangements to achieve their long-term objectives. The 1973 edition of the Minerals Yearbook reviewed some of these developments. U.S. technology related to a high-temperature, gas-cooled reactor was being introduced. The Japanese who already used pressurized light-water and boiling-water reactors were investigating the heavy-water reactor that burns natural uranium rather than enriched uranium used by light-water reactors. They also studied fast-breeder reactors and were investing heavily in the gas-centrifuge method related to "second generation enrichment." Meanwhile, the Japanese continued to look for participation in an additional gas diffusion plant under multinational auspices, which is the standard approach for "first generation" separation of uranium. They considered working with the United States, France, and Australia. Steps were taken to obtain enriched uranium on a long-term basis from the United States but there was a temporary suspension of contract signing by the U.S. Atomic Energy Commission in July, similar negotiations had also taken place with France and the U.S.S.R. A conference was scheduled to be held with Australia to discuss a possible joint project to produce enriched uranium in Australia. Japan was also hoping to produce some enriched uranium itself by 1985.

Japan continued to strengthen its nuclear raw material supply position. Annual requirements for enriched uranium may reach 3,000 tons by 1975 and 2 or 3 times this amount a decade later. Japan also has long-term contracts to obtain large tonnages of uranium oxide from abroad. A contract was pending between Denison Mines, Ltd. (Canada), and Tokyo Electric Power Inc. (Japan) for about 1,800 tons of $U_3O_8$ during 1983–99. Definite agreements have been made with the Rio Tinto Zinc Corp. Ltd. for Canadian and Australian supplies and with the Kerr-McGee Corp. for U.S. supplies. A joint venture was established with the Acuta Mining Co. of Nigeria to obtain 43.3% of the projected yearly output of 2,600 tons of uranium oxide (beginning in 1977 and extending 15 years). Japanese, United States, and Canadian firms were starting a joint uranium exploration venture called Mississippi Uranium Co. to develop Canadian uranium for the Japanese market. Four Japanese companies have joined hands with Cleveland-Cliffs Iron Co. to explore and develop ores from Wyoming. Mitsubishi interests were working with the U.S. firm Minerals Recovery Corp. to explore for uranium in Happy Canyon, Utah.

**Other Metals.**—During 1974 Japan produced nearly 35 tons (about 1.2 million troy ounces) of gold and 999 tons (about 32 million ounces) of silver. Output of gold derived mainly from smelting of imported nonferrous ores was roughly one-tenth higher than in 1973 and imports of gold dropped 30% to 607 tons. Output of silver was nearly the same (only one-third from domestic ores in recent years) as in 1973, whereas imports of silver declined 12% to 900 tons. Platinum imports at 27 tons was 11% lower, and palladium imports at 21 tons was 6 tons lower. Domestic production of platinum and palladium has been nominal. Thus, Japan has had to import most of these noble metals in one form or another.

Japan and the United States are the world's two leading producers of cadmium, a byproduct of zinc smelting. Both metals are produced by the same companies. Japanese output in 1974 of 3,077 tons, 3% down from that of 1973, was nearly identical with U.S. production. However, Japanese cadmium consumption declined sharply by 45% to 927 tons, whereas exports gained only slightly (1,606 tons in 1974 and 1,513 tons in 1973). The three principal markets were batteries, pigment for cosmetic manufacture, and stabilizer for polyvinyl chloride. The cadmium-poisoning pollution scare prompted the Japanese Mining Industry Association to consider a sales-promotion campaign for this metal.

Japan produces only a small quantity of antimony ore and imports the metal in various forms. However, it does produce antimony metal and antimony oxide as follows: 2,783 and 4,492 tons, respectively, in 1973 and 2,166 and 4,418 tons, respectively, in 1974. During 1974, Japan imported 10,857 tons of antimony ore and concentrate (about 50% to 60% grade), including 6,216 tons from Bolivia, 1,974 tons from the PRC, and 907 tons from Thailand. Antimony metal was also imported in 1974, 509 out of a total of 589 tons coming from the PRC. Hibino Metal Industries and Nihon Mining and Concen-

trating Co., Ltd. were the main ingot producers, and these two along with Sumitomo Metal Mining controlled the bulk of Japan's antimony trioxide output. Hibino Metal Industries remained active in securing antimony materials from the PRC, and it also exported flotation equipment and technology to Pan Pacific Developer Inc. of Sarawak, Malaysia, in the hope of obtaining about 1,000 tons of antimony ore annually. Most of Japanese antimony trioxide goes into flame-proofing and secondarily, glassmaking and plastics.

According to MITI, Japanese output of primary and secondary mercury declined from 136 metric tons (1 metric ton equals about 29 flasks) in 1973 to 55 tons in 1974, along with an import drop from 582 to 265 tons. The consumption decline of 20% to 456 tons in 1974 was attributed mainly to reduced use of mercury in making caustic soda (a shift from mercury to diaphram cells) where consumption was down from 350 tons in 1973 to only 213 tons in 1974. Exports also dropped, from 67 tons in 1973 to 33 tons in 1974.

Japan was also an important world producer of other byproduct metals like bismuth, selenium, and tellurium.[25] Bismuth production and consumption showed slight declines, but selenium and tellurium made gains. Production was mainly by the half-dozen ranking nonferrous metal companies. Bismuth output was close to 800 tons, whereas consumption was less than half of this amount, with three-fourths going into metallurgical additives, ferrite, and alloys. Selenium production moved up 5.8% to 363 tons, and consumption increased 3.6% to 199 tons. The three leading domestic selenium markets were glass, rectifiers, and pigments. Because of the brisk overseas demand for selenium, Nippon Mining was expected to double capacity to match Mitsubishi Metal Corporation's existing capacity. These two companies and Mitsui Mining and Smelting provided nearly all of Japan's 1974 output of 25.9 tons of tellurium.

Japan also produced many other metals, usually of high purity and generally in quantities prominent by world standards. Average monthly output for some of these during 1974 was as follows, in tons: Germanium, 1.5; germanium oxide, 1.2; lanthanum oxide, 11; hyperpure silicon, 19; tantalum, 4; and zirconium, about 10. Most production figures are much lower than capacity figures because of the worldwide economic recession.

## NONMETALS

**Cement.**—Japan's cement output was down about 7% from the 78 million tons produced in 1973, the first decline in many years. Domestic sales of 70 million tons in 1974, showed a decline of 9.4% that could be attributed to the recession. Exports remained nominal. Japan ranked with the United States as the largest cement producer in the world, after the U.S.S.R. Japan's construction activities slowed down somewhat but were hardly at a standstill, and the overall situation improved in the second half of the year.

Ube Industries, claims to have the world's foremost cement kiln at Isa, Yamaguchi Prefecture, rated at over 2 million tons. Early in 1974, Kawasaki Heavy Industry Ltd. received an order for an 8,500-ton-per-day plant equipped with Kawasaki's "KSV" suspension preheater. Presumably, this will be installed at Ube. Together with the company's third cement factory at Kanda, Ube Industries was capable of producing about 11.5 million tons of cement annually at yearend 1974. Kawasaki's "RSP" (reinforced suspension preheater) system has been installed at Onoda Cement Co. Ltd.'s Ofunato cement plant in the form of a 3,000-ton-per-day and a 5,500-ton-per-day kiln. Among other new facilities recently installed were the Chichibu Cement Co. Ltd.'s 2-million-ton wet-process unit at Kumagaya (Saitama Prefecture); Nihon Cement Co. Ltd.'s 1.2-million-ton kiln at Kamiiso (Hokkaido); Sumitomo Cement Co. Ltd.'s 1.2-million-ton plant at Ako Nakamizu (Hyogo Prefecture); and Denki Kagaku Kogyo K.K.'s 900,000-ton kiln at Omi (Niigata Prefecture). Thus, Japan has some of the world's largest and newest cement facilities.

**Fertilizer Materials.**—Japan's chemical fertilizer industry, second largest in the world, had a complicated and uncertain year. Production did not change much,

[25] Page 1 of work cited in footnote 19.

exports were down slightly, raw material and power costs soared, and export prices doubled although they were still below international levels. Because of price and delivery schedule differences, the fertilizer talks with the PRC were temporarily suspended in June. Subsequently, however, two half-year fertilizer accords were signed with the PRC.

Japan's fertilizer industry has long been highly export-oriented. During 1974, production and exports (in parentheses) of various chemical fertilizers were as follows, in thousand tons: Ammonium sulfate, 2,078 (713); urea, 3,416 (2,249); ammonium chloride, 959 (558); calcium superphosphate, 798 (small); fused magnesium phosphate, 527 (small); and complex fertilizers, 4,106 (small). Total value of all fertilizer exports in 1974 was Y137.5 billion (about $470 million). Approximately three-fourths of the export value consisted of urea, and the PRC took about two-thirds of the exports. Aside from conventional fertilizers, Japan also exported small quantities of anhydrous ammonia, mainly to the United States, Costa Rica, and the Republic of Korea and aqueous ammonia to the Philippines. The PRC took 43% of Japan's urea exports, 82% of the ammonium chloride, and 48% of the ammonium sulfate during 1974.

In contrast to adequate supplies of nitrogen (from the air) and sulfur, Japan continued to be almost totally dependent upon foreign sources for phosphate rock and potash. During 1974, Japan imported 3,844,959 tons of phosphate rock, including 2,162,028 tons from the United States and 659,505 tons from Morocco. Annual potash needs have been about 1.2 million tons in recent years, almost half from Canada, 15% to 20% from the U.S.S.R., 10% to 15% from the United States, and 10% each from Israel and West Germany.

**Fluorspar.**—Japan's output of fluorspar remained nominal compared with overall supply. Consumption based overwhelmingly on imports surpassed the ½-million-ton mark for the 6th year in a row. About two-thirds of the fluorspar went into steel smelting, and most of the rest went into aluminum reduction and manufacture of chemicals. Fluorspar has been particularly essential in oxygen converter steel smelting as a fluxing material to remove impurities. However, Japanese steelmakers have been successful in cutting down fluorspar consumption through substitution, mixing, use of synthetic fluxes, and improving smelting efficiency. In aluminum reduction, there has been increasing recycling of fluorine chemicals and materials. In chemicals, more synthetic cryolite and fluorides are recovered to satisfy pollution control standards. In fact, Japan produced about 35,000 tons of synthetic cryolite in fiscal year 1973–74 and sold most of this abroad. The trend was subsequently reversed with most of the synthetic cryolite reused domestically and only 3,723 tons exported in 1974.

Japan's producers of hydrofluoric acid from imported fluorite include Morita Kakagu Kogyo Co., Ltd., Hashimoto Chemical Industries Co., Ltd., Nippon Light Metal Co., Tohoku Hiryo K.K., and Asahi Glass Co., Ltd.

Japan's 1974 imports of fluorspar totaled 541,304 tons, including 188,393 tons from Thailand; 179,485 tons from the PRC; 126,943 tons from the Republic of South Africa; 24,277 tons from Kenya; and 10,413 tons from the Republic of Korea. The 1974 total was about 33,000 tons lower than the 1973 figure and 51,000 tons higher than the 1972 figure. Only a small part of Thai shipments to Japan was acid-grade flotation fluorspar concentrates. Chinese fluorspar was mainly of metallurgical grade. Kenya fluorspar was preferred over Chinese fluorspar because prices are lower and sizes are more even. Mexico was expected to become a significant supplier of aluminum fluoride to Japan as soon as a plant producing this is completed at Torreon. Meanwhile, because of inventories and various other reasons, Japanese steelmakers were considering importation of only 200,000 tons of metallurgical fluorspar in fiscal year 1975 and were cutting back imports from Thailand to 100,000 tons. The Thais were most unhappy about this, since they had hoped to sell 200,000 tons. The Chinese quota for steel use was 50,000 tons and the Kenya quota 40,000 tons. Apparently, the Japanese would like to buy more material from the Fluorspar Co. of Kenya if able to reduce purchases from other countries.

**Salt.**—Japan's salt production of 1.15 million tons in 1974 compares with imports of approximately 7.75 million tons. Domestic output has been declining, whereas imports have been increasing slightly.

Breakdown of 1974 imports shows 3.61 million tons from Australia, 3.32 million tons from Mexico, and 0.81 million tons from the PRC, the three major suppliers. All three have gotten price boosts of more than $1.00 per ton f.o.b.

Mexico's largest salt-producing firm, Exportadora de Sal, S.A. (ESSA) operated the Guerrero Negro salt complex in Baja, California, and is a joint venture of Mitsubishi Corp. (75%) and the Mexican Government (25%). Producing about 5 million tons annually, Guerrero Negro has furnished Japan with more than 2.8 million tons annually during the last 3 years. ESSA wants a 3- to 5-year contract in 1975 to ship 3.3 to 3.37 million tons yearly to Japan in 50,000- ot 120,000-deadweight ton ships. The export price was boosted from $3.56 per ton to $4.98 per ton f.o.b. in June.

With the exception of the leading producer Texada Mines Ltd., Australia's "solar" salt industry centered in Western Australia has been developed primarily for the Japanese market. Two fairly large producers supplied most of the salt to Japan: Dampier Salt Ltd. with an annual capacity about 2 million tons and annual shipments to Japan of about 1.3 million tons and Leslie Salt Co. with an annual capacity of 1.2 million tons to be expanded to 3 million tons. Western Australia already can produce about 6 million tons of salt, with more than half going to Japan. Recent contracts with the PRC show that yearly shipments to Japan will be reduced somewhat because of quality and price considerations.

Salt is needed in Japan mainly by the chlor-alkali industry, headed by Hokkaido Soda Co., Ltd., Nippon Soda Co., Ltd., Sumitomo Chemical Co., Ltd., Toyo Soda Manufacturing Co., Ltd., Tokuyama Soda Co., Ltd., Central Glass Co., Kanto Denka Kogyo Co., Ltd., Okayama Chemical Co., Ltd., Nippon Carbide Industries Co., Ltd., Tekkosha Co., and Ryo-Nichi Co. In 1974, Japan produced 3.16 million tons of caustic soda, 1.33 million tons of soda ash, and 2.77 million tons of chlorine gas. Growth in demand for these products has been estimated at 5% to 8% annually. Difficulty in finding plant sites prompted four Japanese firms to join with Comalco Ltd. to start building a 500,000-ton-per-year caustic soda plant in Pilbara, Australia. New soda plants in Japan are mostly diaphragm type, and most mercury plants were being modernized. Inventories of salt were building up to a million tons and caustic soda output was intermittently curtailed near year-end because of the sluggish demand for polyvinyl chloride.

**Sulfur.**—Japan's production of elemental sulfur from indigenous ores amounts to only 5% to 10% of the overall supply. However, sulfur recovered from petroleum refining increased sharply until 1973. Byproduct output of sulfur reportedly totaled 721,648 tons, showing no great change as compared with 1973 output. Production figures of sulfur by specific Japanese oil refineries during 1974 were listed in Japan Chemical Week.[26]

Idemitsu Kosan Co., Ltd., with four refineries and Toa Nenryo Kogyo K.K. with three refineries accounted for some 20% of the Japanese total. Ten refineries recovered more than 30,000 tons of sulfur each in 1974, headed by the Okinawa refinery of Okinawa Sekiyu, the Chiba refinery of Idemitsu Kosan, the Mizushima refinery of General Sekiyu, the Kawasaki refinery of Maruzen Oil Co., Ltd., the Nigushi refinery of Koa Oil Co., Ltd., and the Hyogo refinery of Toa Nenryo.

Actual production of elemental sulfur was much lower than capacity, which may be about 4,500 tons per day. Byproduct sulfur output was higher in the first half than the second half of the year because of some curtailment in crude oil refining. Some surplus sulfur was shipped to the Republic of Korea, Indonesia, and Singapore. However, most sulfur was consumed in Japan, in production of synthetic fibers, carbon disulfide, and Japanese rinsan which together accounted for three-quarters of the 1974 total; paper and pulp ranked next using 10% to 15% of the 1974 total.

Japan has no resource problem with regard to the sulfur needed for making sulfuric acid, because it has long been one of the world's leading producers of pyrite. The country also has many cupriferous, zinc, and complex metal mines with sulfide ores. In addition, Japan imports large tonnages of sulfur contained in nonferrous sulfides as well as the sulfur contained in crude oil. Japan has built up an annual capacity of about 9 million tons of 100% sulfuric

[26] Japan Chemical Week (Tokyo). Apr. 17, 1975, p. 7.

acid.[27] Japan's large nonferrous metal mining companies and smelters were very prominent in sulfuric acid production, along with chemical and petroleum refining firms. An excessive supply of sulfuric acid was building up early in 1975, and various nonferrous companies were considering cutbacks in metal output to counteract this dilemma.

## MINERAL FUELS

**Coal.**—Japan's domestic coal production continued to decline. The approximately 20.4 million tons of coal produced in 1974 was only about two-fifths the output a decade ago, and compared with 1972 figures, the decline was more than 8 million tons. The downward trend was expected to continue and could eventually approach the 10-million-ton-per-year level. Efforts were being made by the Japanese Government to prevent coal production from dropping below the 15- to 20-million-ton-per-year level. The recent energy crunch accentuated the need for preserving the internal coal production capability, particularly in the face of substantial price increases for foreign coal.

The Japanese Government was considering taking over long-term debts of coal enterprises providing no-interest loans or outright grants to high-efficiency mines, permitting higher coal prices, and giving subsidies for mine modernization and safety. The Government may also help mining companies obtain operating funds, urge large-scale users to buy more domestic coal and provide assistance with regard to mine shutdowns, welfare of discharged workers, and establishment of new industries in coal districts. Unfortunately, the program was slowed down by the economic recession.

Virtually, all coal produced in Japan during 1974 was bituminous coal. About half the coal was "ordinary" or steam-raising coal, and the other half was "raw material" or coking coal plus a little gas coal. Japan's preponderently weakly caking coal generally must be blended with high-grade imported coal for smelting use. Hokkaido, the big island to the north, and Kyushu, to the south of the main island of Honshu, provided the bulk of the Japan's coal output, with Hokkaido half as important as Kyushu. Almost all Japanese coal comes from large mines, with the Miike mine in Kyushu heading the list.

Japan's 1974 energy balance showed that approximately 68% of the energy consumed was derived from imported crude oil, 6% from imported refined petroleum, 3% from imported liquefied petroleum gas and LNG, 11% from imported coal, 3% from domestic coal, 6% from indigenous hydropower, and 2% from other lesser sources. Coal consumed in electric power generation was only about 19 million tons in 1974.

The role of coal in steelmaking was much more important than energy. In fact, approximately 66 million tons of coal—nearly 57 million tons of foreign coal and 9 million tons of domestic coal—were consumed by the steel industry in 1974. Most of the Australian and Canadian coals which were generally medium quality were used as such. In contrast, the exceptionally high-quality U.S. coking coals were blended with weakly caking indigenous coals for quality-improvement purposes. During 1974, Japan's total coal imports were 64.16 million tons and the United States, Australia, and Canada furnished 57.99 million. Specifically, the U.S. share was 25.42 million (16.5 million in 1973); Australia's share, 22.87 million (24.9 million in 1973); and Canada's share, 9.70 million (10.4 million in 1973). Japan's coal import bill was Y844.6 billion in 1974 (Y369 billion in 1973), remembering that the average exchange rate was about Y291 to the dollar (compared with Y265 in 1973).

MITI made plans to dispatch various missions to Oceanian, South and North American, and African countries in 1975 to study development of overseas resources of ordinary coal, so that Japanese coking coal supplies for steelmaking will be adequate for the next 5 to 10 years. Coal-fueled powerplants were gaining in importance after the oil crisis, and domestic production of such coal probably will continue to decline, leaving a shortage of 10 to 20 million tons annually after 1980. Use of more "formed coal" by the steel industry in the future also became a reason for requiring more ordinary coal.

Deliveries of steelmaking coal to Japan showed a 6-million-ton increase in 1974, although consumption went up only about 2 million tons. There probably was "hedge" buying because of the high price increase for coal. Whereas oil prices stabilized and

[27] Japan Chemical Week (Tokyo). July 18, 1974, pp. 1, 5. (This source mentions many of the new sulfuric acid plants.)

were slightly lower in some cases, coal prices were still spiraling. U.S. Itman and Beatrice coals were close to $27 per ton f.o.b. in January and $55 in December. Some spot purchases of the best low-volatile coals went up to as high as $130. At year-end, U.S. suppliers were trying to sell low-volatile coal at $90 per ton and medium-volatile coal at $70, which the Japanese thought exhorbitant. Anyhow, negotiations on prices and tonnages were taking place with established U.S. suppliers. Whereas the price of U.S. coals roughly doubled, freight rates to Japan for 50,000-tons vessels from Hampton Roads, Va., were $17 to $22 per ton up to July, generally $12 to $15 late in 1974, $8 to $9 early in 1975, and less than $6 in May 1975.

Although price increases played an important role in relationships with new coal suppliers in the United States and other countries, other factors were also significant. Japan frequently helps to develop coal mines which in turn depend primarily on the Japanese market. Agreements and negotiations were often long-term in nature dealing with matters like loans, investments, advance of funds, technical and equipment help, and delivery tonnages and schedules, along with prices. Japan's steel industry, unlike most other mineral and metal industries, did not and probably will not greatly reduce production as a result of the recession. Thus, its coal acquisitions from abroad did not change much in tonnage and the Japanese were not negotiating for cutbacks in 1974 but rather for better adherence to schedules regarding development and deliveries.

Near the end of 1974 Japanese steelmakers signed a basic agreement with Thiess Peabody Mitsui Pty., Ltd. (TPM), of Australia to import three brands of Nebo coals from Queensland totaling 75 million tons to be shipped at 5 million tons per year beginning in 1979. The Japanese will extend credit amounting to 210 million Australian dollars ($A) to TPM to build railways for coal transport.[28] Headed by Nippon Steel Corporation they also were negotiating a 15-year, 4.5-million-ton-per-year contract with a consortium comprised of Western Mining Corp. and others to import Hail Creek coal from Queensland beginning in 1978. For this development, the Japanese were prepared to make a $A60 million loan.

Nippon Kokan and other Japanese companies will participate in a joint venture with Kaiser Resources Corp. to develop the Hosmer Wheeler coal mine near Sparwood in British Columbia, Canada, by hydraulic mining techniques. Terms and delivery schedules will be determined at a later date after feasibility studies.[29] Kaiser was already committed to ship 4.5 million tons of Balmer coal to Japan annually. The Japanese have already signed other long-term contracts, such as the one with Gregg River Resources Corp. Ltd. to obtain Canadian coal. The Japanese were having price troubles with Fording River Corp., Ltd. of Canada. The Canadians want to push the price up $20 per ton to $52 in fiscal 1975, whereas the Japanese felt that $43 should be the maximum price.

Nippon Steel and others signed a 15-year, 3-million-ton-per-year contract with U.S. Pipe & Foundry Co. (potential producer) to import Blue Creek coal from Alabama beginning in 1978. In this case the Japanese have extended a $40 million loan to aid development. Sumitomo Metal Industries concluded a 13-year contract with Cerro Company to import 1 million tons of low-volatile coal from Pennsylvania beginning in 1975 and agreed to extend a $35 million loan for repayment in 10 years. The Japanese also have other important contracts in Australia, Africa, and the U.S.S.R. (South Yakutsk, Siberia) to obtain coking coals. With all these projects, the Japanese do not expect a coking coal shortage after 1978.

**Petroleum.**—The Japanese call 1974 the year of the "oil shock." The oil import bill went up from Y1,831 billion (about $6.4 billion) in 1973 to Y6,160 billion (about $21.1 billion) in 1974, the latter representing nearly one-third the value of Japan's total imports. Early in 1974 the Government was enforcing a state of emergency with 10% cutbacks in oil and power consumption. It was reported that "neon lights went out, offices switched off heaters, and factories slowed down operations."[30] Consumer and wholesale prices

[28] Japan Metal Bulletin (Tokyo). Feb. 6, 1975, p. 1.
[29] Japan Metal Bulletin (Tokyo). Feb. 27, 1975, p. 1.
[30] Japan External Trade Organization (Tokyo). The Oil Crisis: A Year Later the Pain Lingers on. Focus Japan. V. 2, No. 1, January 1975, pp. 2–3.

went up roughly 20% and 30%, respectively, during the year. Price freezes were not fully lifted until the end of August. Oil reserves fell early in 1974 but were slowly replenished by September. However, overall oil imports were down only 3%, dropping to 1.76 billion barrels (including 1.64 billion of crude) in 1974. With domestic crude production of little consequence, refined production also declined approximately 3% to 1.49 billion barrels. During 1974, only 250,000 barrels per day of refinery capacity was added. The oil industry could not pass on the sharply increased costs and had to make financial plans for raising funds to build up a larger national stockpile.

At yearend, the Japanese Government planned to introduce a bill promoting the "rationalized" use of energy and had already established an organization to encourage public savings of energy. Both government and industry favor reinforcing future oil stockpiling possibly to a 90-day supply level. MITI stated that the Y1,500 billion needed for stockpiling should be totally borne by industry, whereas industry claimed that cost estimates are grossly underestimated and there is no way to fund the project without financial assistance. The Government wanted to reorganize independent firms into a giant "Japanese oil major" for competitive advantages, but industry feels that this does not necessarily make for better efficiency. Another goal, fostering independent oil development, was also bogged down at yearend, with the Government apparently eager to expand its role, whereas industry only desired government funds.

Early in 1975, the MITI view prevailed when it was decided that the Japanese Petroleum Development Corporation Law would be recommended for revision to enable the wholly government-owned Japan Petroleum Development Corporation to promote reorganization of the oil-developing industry and to encourage development of oil resources and stability of oil imports.[31] The draft revision would let the Corporation buy prospecting and mining rights from foreign countries, because oil-producing nations often show preference for government-to-government dealings. However, the rights of the Corporation would later be transferred to private companies. The revision would also grant authority to invest in companies specializing in government-to-government-based oil imports and extend credits to state-owned firms in oil-producing countries in exchange for oil imports. Japanese authorities hope also to broaden their economic, social, and cultural cooperation with oil-producing nations while obtaining oil supplies.

Japan's new energy conservation program envisages savings of 150,000 barrels of oil per day during 1975. The oil consumption curb, which went into effect on January 1, 1975, is expected to reduce the nation's crude oil imports by about 3%.[32] Domestic consumption of refined oil products declined 2.6% compared with that of 1973, dropping to 1.42 billion barrels in 1974; it took an oil crisis to reverse the trend of increased petroleum consumption. The timid conservation program being implemented had been designed to economize the use of oil and electricity without excessively suppressing industrial activities. Savings in energy consumption does not mean cuts in oil imports because of commitments to suppliers and efforts to build up stockpiles. The industrial sector will be subjected to an energy control campaign, the Government sector will aim at a 13% reduction, and the nonindustrial sector is requested to save 10%.

Although most of the sharp crude oil price rises took place late in 1973, additional increases were registered in 1974. Quoted below are representative import prices for crude oil to Japan in 1974, in terms of U.S. dollars per barrel, f.o.b. source.

[31] Japan External Trade Organization (Tokyo). Turning Point for Oil Development. Focus Japan. V. 2, No. 2, February 1975, pp. 2–3.

[32] Japan Petroleum Weekly (Tokyo). Jan. 6, 1975, p. 5.

| Type | January | November |
|---|---|---|
| Iranian heavy | $8.31–$10.23 | $10.45–$10.60 |
| Iranian light | 8.85– 10.40 | 10.67– 10.79 |
| Kuwait | 9.89 | 10.47 |
| Murban | 10.30– 11.75 | 11.38– 11.60 |
| Arabian light | 8.75 | 10.46 |
| Arabian medium | 8.63 | 10.38 |
| Arabian heavy | 8.50 | 10.27 |

Within Japan, oil product prices did not follow the same as those for crude because of demand-supply relationships and controls. Price trends are shown as follows, in yen per kiloliter:[33]

| Product | January 1974 | December 1974 |
|---|---|---|
| Motor gasoline: | | |
| Premium | 31,500 | 56,000 |
| Regular | 26,700 | 48,200 |
| Naphtha | 12,200 | 26,800 |
| Jet fuel | 13,000 | 27,500 |
| Kerosine: | | |
| Industrial | 16,900 | 33,500 |
| Home heating | 12,900 | 25,700 |
| Gas oil | 16,400 | 28,000 |
| Fuel oil A | 16,400 | 28,100 |
| Fuel oil B | 11,200 | 19,500 |
| Fuel oil C (varies with sulfur content) | 11,800 | 20,600 |
| Crude oil cost, c.i.f. | 8,840 | 22,168 |

The Japanese oil industry incurred large debts in 1974 for various reasons. The sharp price increases depressed consumption. The shipper's usance period was generally shortened from 60 to 30 days after loading date as recorded on the bill of lading. Interest rates on "dollar loans" went up to 12% per annum for covering the 4-month period after customs clearance. The "yen loans" period has been cut from 60 to 20 days so that the oil industry often has to resort to other funds with interest higher than the 9.5% per annum for "yen loans." Japanese refiners' average financial burden due to interest payment used to be about Y250 per kiloliter of product refined, but this had gone up to Y1,250. Futhermore, fluctuation in foreign exchange also poses a serious problem to the Japanese oil industry.

As of December 31, 1974, Japan had 48 refineries owned by 32 companies, with a total atmospheric distillation capacity of 5,660,360 barrels per day (bpd). Corresponding downstream capacities were as follows: Vacuum distillation, 1,628,200 bpd; catalytic cracking, 327,100 bpd; catalytic reforming, 566,300 bpd; middle distillates hydrodesulfurization, 1,122,300 bpd; fuel oil desulfurization, 963,500 bpd; hydrocracking, 12,500 bpd; lube oil solvent extraction, 60,160 bpd; lube oil solvent deasphalting, 49,100 bpd; lube oil solvent dewaxing, 58,070 bpd; sulfur recovery 5,035 tons per day; and liquefied petroleum gas (LPG) recovery, 22,527 tons per day.[34] There were 35 vacuum distillation units, 39 catalytic reforming units, and 19 catalytic cracking units. As of yearend, Japan also had 1,733,000 bpd of additional refining capacity under construction or in the planning stage.

[33] Yen exchange was about Y285=US$1.00 in 1973 and Y292=US$1.00 in 1974. One kiloliter equals 6.29 barrels.

[34] Japan Petroleum Weekly (Tokyo). Jan. 27, 1975, pp. 1–4.

| Company and refinery | Capacity, barrels per day | |
|---|---|---|
| | December 1973 | December 1974 |
| Asia-Kyoseki: Sakaide | 60,000 | 100,000 |
| Asia Sekiyu: | | |
| Hakodate | 25,000 | 25,000 |
| Yokohama | 100,000 | 100,000 |
| Daikyo Sekiyu: Yokkaichi | 195,000 | 195,000 |
| Fuji Kosan: | | |
| Kainan | 77,600 | 77,600 |
| Fuji Sekiyu: Sodegaura | 140,000 | 210,000 |
| General Sekiyu: | | |
| Kawasaki | 55,000 | 55,000 |
| Sakai | 120,000 | 120,000 |
| Idemitsu Kosan: | | |
| Chiba | 310,000 | 310,000 |
| Hyogo | 110,000 | 110,000 |
| Tokuyama | 140,000 | 140,000 |
| Tomakomai | 70,000 | 70,000 |
| Kansai Sekiyu: Sakai | 110,000 | 110,000 |

| Company and refinery—Continued | Capacity, barrels per day | |
|---|---|---|
| | December 1973 | December 1974 |
| Kashima Sekiyu: Kashima | 180,000 | 180,000 |
| Koa Sekiyu: | | |
| Marifu | 149,000 | 149,000 |
| Osaka | 80,000 | 80,000 |
| Keyokuto Sekiyu: Chiba | 100,000 | 150,000 |
| Kyushu Sekiyu: Oita | 170,000 | 170,000 |
| Maruzen Sekiyu: | | |
| Chiba | 195,000 | 195,000 |
| Matsuyama | 50,000 | 50,000 |
| Shimotsu | 37,500 | 37,500 |
| Mitsubishi Sekiyu: | | |
| Kawasaki | 105,000 | 105,000 |
| Mitsushima | 220,000 | 270,000 |
| Nansei Sekiyu: Nishihara (Okinawa) | 80,000 | 80,000 |
| Nichimo Sekiyu: Kawasaki | 100,000 | 100,000 |
| Nihonkai Sekiyu: Toyama | 60,000 | 60,000 |
| Nihon Kogyo: | | |
| Funakawa | 14,150 | 14,150 |
| Mizushima | 235,200 | 235,200 |
| Nihon Sekiyu: Niigata | 26,000 | 26,000 |
| Nihon Sekiyu Seisei: | | |
| Kudamatsu | 42,000 | 42,000 |
| Muroran | 110,000 | 110,000 |
| Negishi | 330,000 | 330,000 |
| Yokohama | 70,000 | 70,000 |
| Okinawa Sekiyu: Henza (Okinawa) | 100,000 | 100,000 |
| Seibu Sekiyu: Yamaguchi | 110,000 | 110,000 |
| Showa Sekiyu: | | |
| Kawasaki | 149,000 | 149,000 |
| Niigata | 43,000 | 43,000 |
| Showa Yokkaichi: Yokkaichi | 310,000 | 310,000 |
| Taiyo Sekiyu: Kikuma | 59,000 | 69,000 |
| Teiseki Topping: Kubiki | 4,410 | 4,410 |
| Toa Nenryo Kokyo: | | |
| Kawasaki | 200,000 | 200,000 |
| Shimizu | 43,500 | 43,500 |
| Wakayama | 187,000 | 187,000 |
| Toa Sekiyu: | | |
| Kawasaki | 100,000 | 100,000 |
| Nagoya | 100,000 | 100,000 |
| Toho Sekiyu: Owase | 40,000 | 40,000 |
| Tohoku Sekiyu: Sendai | 70,000 | 100,000 |
| Toyo Sekiyu: Nakagsk (Okinawa) | 28,000 | 28,000 |
| Total | 5,410,360 | 5,660,360 |

Japan's crude output continued to decline, dropping from 5.14 million barrels in 1973 to 4.94 million barrels in 1974. The indigenous quantities represented only about one-third of 1% of the overall supply. The country's natural gas position is only slightly better, and plans were being made to import increasing quantities of LNG. While stressing Japanese-controlled oil exploration and production abroad, MITI and private companies were accelerating the program to develop the offshore areas adjacent to Honshu Island. For fiscal 1975, MITI has set aside Y518 million for general oil and gas surveys and Y680 million for natural gas subsidies.[35] Loans totaling Y3.5 billion will also be extended by the Japan Development Bank for new oil projects on the Continental Shelf. Emphasis will be placed on development of oil and gas resources off the coast of Aga in Niigata Prefecture and natural gas off Fukushima Prefecture. Exploration off Aga was being done by a subsidiary of Japan Petroleum Development Corp. together with Idemitsu Exploration Co., Ltd. A drilling platform was built in August, with the hope of commencing production of 200 kiloliters (1,260 barrels) of oil and 1,600 cubic meters of natural gas by yearend 1975, from an oil reserve of possibly 8 million kiloliters (50 million barrels). In Fukushima Prefecture, Teikoku Oil Company, Ltd. and the Exxon group of the United States were jointly engaged in shallow sea exploration off the Joban coast.

[35] Japan Chemical Week. (Tokyo). Jan. 30, 1975, p. 2.

Of seven wells drilled by yearend 1974, five have hit natural gas deposits; the feeling was that Joban was more promising than Aga in terms of natural gas. Some preliminary exploration for natural gas in the waters west of Okinawa was planned to be started in fiscal 1975.

During 1974, Japan obtained 27% of its crude oil from Saudi Arabia, 25% from Iran, 11% from the United Arab Emirates, 10% from Kuwait, 14% from Indonesia, 3.2% from Brunei, 1.8% from Nigeria, 1.6% from the PRC, and 1.4% from Libya. Thus, 77.1% of the total imports (or about 1.36 billion barrels) came from the Middle East, 17.2% from Southeast Asia, 3.5% from Africa, and 2.2% from other countries. Most countries held to the 1973 levels and percentages. However, Iran's share in 1973 was 34% and Saudi Arabia's share was 23%. The PRC was hardly a factor in 1973 but according to contracts made with Japan could furnish 3% of the total or possibly 60 million barrels in 1975. Japan's overall crude oil imports in 1975 were not expected to be much different from those in 1974. At yearend, there was little concern over the adequacy of oil supplies. Also, import prices weakened somewhat.

Direct purchasing of "participation crude" from the Middle East and Africa became more of a factor. For example, the Abu Dhabi Government offered to sell to independent Japanese oil refineries 20,000 barrels of crude oil per day on a direct-deal basis at a price some US$0.50 per barrel lower than the prevailing price; reportedly, the import usance period also prolonged from 30 to 60 days.[36] Iran, Lybia, and Algeria have also cut their crude prices through similar means, although not as much. Slightly lower oil consumption around the world prompted such sales promotion efforts.

In August 1974, the Kuwaiti Government requested participation in the Japanese-owned Arabian Oil Co., Ltd. in the Kuwait-Saudi Arabia Neutral Zone, and Japan accepted this request agreeing that 60% of the Kuwait's share of the output would go to the Kuwaiti Government. However, the Arabian Oil Co. has the right to buy back the oil at 94.8% of the posted price. Arrangements with Saudi Arabia, which also owns part of the operations, have not been clarified. Arabia Oil Co. remained as Japan's only overseas oil-producing firm, supplying around 10% of Japan's needs.

Soviet efforts to interest Japan in participating in the Tyumen oil project fell through late in the year because of increasingly difficult terms. A Soviet-Japanese-United States joint arrangement to prospect for gas in northern Yakutsk, mainly involving the Tokyo Gas Co., Ltd. and the El Paso Natural Gas Co. and a $3.5 billion foreign loan, remained most hopeful. Japan and the Soviet Union did sign a basic agreement on January 28, 1975, whereby $100 million worth of credits will be extended to the U.S.S.R. for the exploration of oil and gas resources on the Continental Shelf of the Far Eastern Soviet island of Sakhalin. If the Sakhalin project is successful, Japan will receive half of the oil output (8.4% discount) for 10 years and mutually agreeable quantities of natural gas to be determined later.[37]

Natural gas and other projects were assuming greater importance. Alaska was already an important source. Japan entered into an agreement with the United States and Indonesia to build LNG plants in North Sumatra and East Kalimantan, whereby Japan would receive 7.5 million tons of LNG annually and the United States would also receive large amounts beginning in 1977. C. Itoh began near yearend to study the possibility of obtaining natural gas from Abu Dhabi. Kyodo Oil Co. and Maruzen Oil Co., Ltd., reached an agreement with the Kuwaiti Government to import 240,000 tons of LPG annually under the "direct deal" formula. The PRC was planning to build large-scale LNG plants in the Takang oilfield and the Szechuan gasfields for exports to Japan.

MITI indicates that about 30 Japanese oil and trading companies have so far submitted their plans for construction of refineries abroad with a combined capacity of almost 5 million barrels per day.[38] Many of these companies are involved in the acquisition of crude oil and construction of other chemical and fertilizer facilities as well. Because of economic difficulties, plans were temporarily shelved late in the year

[36] Page 2 of work cited in footnote 9.
[37] Pages 6–8 of work cited in footnote 34.
[38] Japan Petroleum Weekly (Tokyo). Jan. 13, 1975, p. 8.

on building proposed petrochemical plants in Thailand and South Korea, although one such project was still being considered in Spain. MITI's yearend list of proposed refining construction projects abroad was as follows (figures in parentheses indicate refining capacities after expansion):

| Country | Japanese companies | Quantity (thousand barrels per day) | |
|---|---|---|---|
| Saudi Arabia | Mitsubishi Corporation, Mitsui & Co., C. Itoh, Marubeni, Nichimen, Arabian Oil Co., Maruzen Oil, Mitsubishi Oil—six projects. | 1,300 | (1,950) |
| Abu Dhabi | Mitsui & Co., Maruzen Oil, Daikyo Oil, Nippon Mining, Marubeni—three projects. | 600 | (750) |
| Iran | Mitsubishi Corporation, Mitsui & Co., C. Itoh, Sumitomo Shoji, Nissho-Iwai, Nichimen, Mitsubishi Oil, Idemitsu Kosan, Maruzen Oil, Showa Oil, Kyushu Oil, Kaikyo Oil, Teijin—one joint project. | 500 | |
| Iraq | C. Itoh, Toyo Menka, Mitsubishi Corporation, Marubeni, Sumitomo Shoji, Daikyo Oil, Mitsubishi Oil—one joint project. | 300 | |
| Indonesia | Sumitomo Shoji, Nissho-Iwai, Maruzen Oil, Daikyo Oil, Mitsubishi Oil—two projects. | 250 | (450) |
| Korea, Republic of | C. Itoh, Marubeni, Daikyo Oil, Teijin, Japan Line—two projects. | 300 | (450) |
| Kuwait | Mitsui & Co | 300 | (500) |
| Qatar | Marubeni | 200 | (300) |
| Dubai | do | 150 | |
| Oman | Nichimen, Maruzen Oil | 200 | |
| Tunisia | C. Itoh & Co | 120 | |
| Nigeria | Marubeni | 150 | (300) |
| Guam | Mitsui & Co | 100 | (200) |
| Malaysia | Mitsubishi Corporation, Mitsui & Co., Sumitomo Shoji, Nissho-Iwai, Mitsubishi Oil, Taiyo Oil, Arabian Oil Co., Maruzen Oil—five projects. | 380 | (480) |
| Singapore | C. Itoh & Co | 70 | |
| United States (Hawaii) | Mitsui & Co | 45 | (480) |

# The Mineral Industry of Kenya, Tanzania, and Uganda

By Avery H. Reed [1] and Robert G. Clarke [2]

## KENYA [3]

The mineral industry of Kenya operated at record levels in 1974. Output increased 10% above the 1973 record, to 3.7 million tons valued at $36 million. New annual records were set for the production of carbon dioxide, cement, feldspar, gem stones, lead, magnetite, stone, and vermiculite.

Principal exports were cement and sodium compounds. Leading imports were crude petroleum, iron and steel products, and coal.

[1] Supervisory physical scientist, Division of Nonmetallic Minerals.
[2] Physical scientist, Division of Nonmetallic Minerals.
[3] Prepared by Avery H. Reed.

**Table 1.—Kenya: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| METALS | | | |
| Beryllium, beryl concentrate, gross weight | (1) | -- | -- |
| Copper, mine output, metal content | 72 | e 70 | e 70 |
| Gold, mine output, metal content ... troy ounces | r 1 | 136 | 235 |
| Iron and steel, iron ore, gross weight | r 9,240 | 12,345 | 19,780 |
| Lead, mine output, metal content | 2 | -- | e 20 |
| Silver, mine output, metal content ... troy ounces | -- | 6 | 19,818 |
| NONMETALS | | | |
| Barite | 628 | 903 | 442 |
| Cement, hydraulic | r 799,887 | 792,194 | 878,259 |
| Clays, kaolin | 718 | 947 | e 907 |
| Diatomite | 1,812 | 1,241 | 1,657 |
| Feldspar | 1,962 | 1,461 | 2,842 |
| Fertilizer materials, crude, phosphatic, guano | r 747 | 682 | 352 |
| Fluorspar | 10,457 | 48,000 | e 30,000 |
| Gem stones, precious and semiprecious: | | | |
| Aquamarine ... kilograms | 18 | 18 | NA |
| Garnet [2] ... do | 24 | 17 | 6 |
| Ruby ... do | 6 | -- | 23 |
| Sapphire ... do | 47 | (1) | 295 |
| Tourmaline ... do | 1 | -- | 9 |
| Gypsum and anhydrite e | 100,000 | 100,000 | 100,000 |
| Lime | 22,854 | 32,286 | e 32,000 |
| Magnesite, crude | 628 | 1,517 | e 2,000 |
| Salt: | | | |
| Crude | 37,362 | 35,002 | e 36,000 |
| Refined | 22,783 | 27,688 | 30,256 |
| Soda ash | r 164,160 | 250,800 | 166,933 |
| Soda, raw crushed (trona) | r 3,710 | 4,211 | 1,546 |
| Stone, sand and gravel: | | | |
| Calcareous: | | | |
| Calcite | 969 | 62 | 300 |
| Coral (for cement manufacture) | NA | 1,773,920 | 2,200,000 |
| Kunkur (for cement manufacture) | 61,757 | 54,712 | |
| Limestone (for cement manufacture) | 226,809 | 121,368 | |
| Sand | 12,900 | 12,511 | 17,209 |
| Shale | -- | -- | 167,240 |
| Volcanic ash for cement manufacture | 2,633 | -- | NA |
| Vermiculite | 932 | 871 | 1,683 |
| Wollastonite | -- | 55 | 100 |

See footnotes at end of table.

Table 1.—Kenya: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Carbon dioxide, natural | | 1,124 | 1,666 | 2,187 |
| Petroleum refinery products: | | | | |
| Gasoline, motor | thousand 42-gallon barrels | 2,756 | 2,827 | 3,137 |
| Jet fuel | do | r e 1,336 | 1,360 | 2,422 |
| Kerosine | do | 2,817 | 2,895 | 3,007 |
| Distillate fuel oil | do | r 3,699 | 3,953 | 4,200 |
| Residual fuel oil | do | r 7,319 | 8,559 | 9,191 |
| Other: | | | | |
| Asphalt | do | 281 | 301 | 230 |
| Liquefied petroleum gas | do | 154 | 175 | 197 |
| Refinery fuel and losses | do | 720 | 571 | 760 |
| Total | do | r 19,082 | 20,641 | 23,144 |

e Estimate. p Preliminary. r Revised. NA Not available.
1 Less than ½ unit.
2 Quality (gem or industrial) not specified.

## COMMODITY REVIEW

**Metals.**—*Gold.*—Production of gold was 235 ounces valued at $30,800.

*Iron Ore.*—Output of magnetite expanded 60%, to a record 19,780 tons.

*Lead.*—Output of lead from the Kinagoni mine was 20 tons.

*Silver.*—Production of silver was 19,800 ounces.

**Nonmetals.**—*Barite.*—Output of barite declined 51% below the 1973 record, to 442 tons.

*Cement.*—Cement production increased 11% to 878,000 tons and was 9% above the 1971 record. Total cement output, 1955–74, was 9,275,000 tons valued at $185,500,000.

*Clays.*—Output of shale for cement and clay products decreased 7% and was 11% below the 1971 record. Kaolin production was 907 tons.

*Diatomite.*—Production of diatomite was 1,657 tons valued at $111,000.

*Feldspar.*—Feldspar production was a record 2,842 tons, 7% above the 1971 record.

*Fluorspar.*—Fluorspar Co. of Kenya mined 30,000 tons of fluorspar at the Kerio Valley mine in the Rift Valley. The spar was exported to Japan. Total output, 1968–74, was 76,620 tons valued at $837,300.

*Gem Stones.*—Kenya has become recognized as a favorable place to collect gem stones. Output was a record $227,000. Collectibles were garnet, ruby, sapphire, and tourmaline.

*Gypsum.*—Output of gypsum for cement increased 11% to 100,000 tons, and was 9% above the 1971 record.

*Lime.*—Production of lime decreased 1%. Total lime output, 1941–74, was 607,600 tons valued at $9,889,000.

*Magnesite.*—Production of magnesite was 2,000 tons.

*Salt.*—Output of salt from Lake Magadi increased 15% to 66,256 tons valued at $785,000. Total salt production, 1939–74, was 920,600 tons valued at $21,210,000.

*Soda.*—Production of soda from Lake Magadi declined 20% to 168,500 tons. Total output, 1936–75, was 3,987,000 tons valued at $112,800,000. Reserves of soda are more than 100 million tons.

*Stone.*—Crushed limestone output increased 13% to 2.2 million tons, 11% above the 1971 record. Most of the stone was used in cement manufacture. Total production of crushed stone, 1948–74, was 16,600,000 tons valued at $5,587,000.

*Vermiculite.*—Output of vermiculite was a record 1,683 tons valued at $96,610.

*Wollastonite.*—Production of wollastonite was 100 tons valued at $2,800.

**Mineral Fuels.**—*Petroleum.*—Petroleum has not been discovered in Kenya. The oil refinery at Mombasa operated on imported crude oil.

Nineteen petroleum companies which were exploring for oil in Kenya have completed extensive geophysical examinations. They are Adobe Oil Co., Anschutz Corp., BP-Shell Petroleum Development Company of Kenya Ltd., Burmah Oil Development Inc., Canadian Export Gas and Oil Ltd., Canadian Homestead Oils Ltd., Canadian Superior Gas and Oil Co. Ltd., Chevron Oil Company of Kenya, Cities Service Company, Louisiana Land & Exploration Co., Oceanic Exploration Co., Petrola Co., Polar Bear International Petroleums, Sun Oil Co., Texas Pacific Co., Inc., Total Co., Union Texas Petroleum., Wainoco Inc., and Whitestone Corp.

The Kenyan Government informed all of these companies of its option to acquire 50% of the equity in any of these companies.

## Table 2.—Kenya: Exports and reexports of mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum metal, including alloys, all forms ---------- value ---- | $65,840 | $76,949 |
| Iron and steel metal: | | |
| Scrap | 9,631 | 8,829 |
| Semimanufactures: | | |
| Angles, shapes, sections | 701 | 2,036 |
| Tubes, pipes, fittings | 284 | 674 |
| Universals, plates, sheets | 863 | 7,886 |
| Rods and bars | 1,094 | 793 |
| Wire | 1,115 | 687 |
| Hoops and strips | 6 | 109 |
| Primary forms | -- | 25 |
| Other: | | |
| Ore and concentrate of base metals, n.e.s | 2 | -- |
| Nonferrous metals, scrap, n.e.s | 3,196 | 3,223 |
| NONMETALS | | |
| Abrasives, natural, n.e.s | 837 | 816 |
| Cement | 469,233 | 448,922 |
| Clays and clay products | 3,391 | 143 |
| Fertilizer materials, manufactured: | | |
| Phosphatic | 1,058 | 1,336 |
| Other, including mixed | 7,725 | 1,739 |
| Gypsum and plasters | 1,457 | 2,394 |
| Lime | 952 | 905 |
| Magnesite | 265 | -- |
| Precious and semiprecious stones, except diamond ---------- value -- | $59,222 | $313,592 |
| Salt and brine | 2,114 | 2,147 |
| Sodium compounds, soda ash, sodium carbonate | 149,876 | 204,841 |
| Stone, sand and gravel | 228 | 87 |
| Sulfur, sulfuric acid | 3 | 226 |
| Other nonmetals, n.e.s ---------- value -- | $100,718 | $170,471 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Hydrogen, helium, rare gases ---------- do ---- | $138,603 | $98,658 |
| Petroleum refinery products: | | |
| Gasoline, including natural --------- thousand 42-gallon barrels -- | 1,605 | 1,634 |
| Kerosine ---------- do ---- | 575 | 559 |
| Jet fuel ---------- do ---- | 2,099 | 1,469 |
| Distillate fuel oil ---------- do ---- | 1,843 | 2,092 |
| Residual fuel oil ---------- do ---- | 5,421 | 6,020 |
| Lubricants ---------- do ---- | 463 | 294 |
| Other: | | |
| Nonlubricating oil, n.e.s ---------- do ---- | 46 | 1 |
| Bitumen and other residues ---------- do ---- | 106 | 83 |
| Bituminous mixtures, n.e.s ---------- do ---- | 56 | 64 |
| Liquefied petroleum gas ---------- do ---- | 76 | 49 |

[1] Includes transfers to Uganda and Tanzania.

## Table 3.—Kenya: Imports of major mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum metal including alloys: | | |
| Unwrought ---------- value -- | $612 | $820 |
| Semimanufactures | 2,176 | 2,692 |
| Copper metal including alloys: | | |
| Unwrought | 47 | 21 |
| Semimanufactures | 489 | 664 |
| Gold metal ---------- troy ounces -- | 20,990 | 6,277 |
| Iron and steel: | | |
| Ore and concentrate | 10 | 10 |
| Metal: | | |
| Scrap | 48 | 391 |
| Pig iron and ferroalloys | 1,729 | 856 |
| Steel, primary forms | 28,029 | 24,102 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections: | | |
| Wire rod | 9,662 | 3,364 |
| Other bars and rods | 3,073 | 6,690 |
| Angles, shapes, sections | 10,148 | 10,570 |
| Universals, plates, sheets | 60,276 | 90,545 |
| Hoop and strip | 2,300 | 2,470 |
| Rails and accessories | 2,073 | 9,402 |
| Wire | 7,677 | 12,885 |

See footnotes at end of table.

## Table 3.—Kenya: Imports of major mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS—Continued** | | |
| Iron and steel—Continued | | |
| Metal—Continued | | |
| Semimanufactures—Continued | | |
| Tubes, pipes, fittings: | | |
| Cast iron tubes and pipes | 652 | 500 |
| Seamless tubes and pipes | 9,491 | 2,377 |
| Welded and clinched tubes and pipes | 13,288 | 7,731 |
| High pressure hydroelectric conduits | -- | 296 |
| Tube and pipe fittings | 1,455 | 1,245 |
| Castings and forgings, rough | 4 | -- |
| Lead metal including alloys: | | |
| Unwrought | 537 | 729 |
| Semimanufactures | 31 | 119 |
| Manganese ore and concentrates | 319 | 1,126 |
| Nickel including alloys | 2 | 3 |
| Platinum-group metal including alloys, all forms troy ounces | 109 | 3,578 |
| Silver metal incuding alloys, all forms do | 11,759 | 19,280 |
| Tin metal including alloys: | | |
| Unwrought long tons | 90 | 33 |
| Worked do | 93 | 329 |
| Zinc metal including alloys: | | |
| Unwrought | 2,621 | 3,432 |
| Semimanufactures | 1,061 | 1,161 |
| Other: | | |
| Nonferrous metals, scrap | 221 | 303 |
| Metals including alloys, all forms value | $1,826 | $697 |
| **NONMETALS** | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | 171 | 414 |
| Grinding and polishing wheels and stones | 99 | 52 |
| Asbestos | 11 | 156 |
| Cement | 65,797 | 16,803 |
| Clays and clay products (including all refractory brick): | | |
| Crude clays, n.e.s | 820 | 1,067 |
| Products: | | |
| Refractory (including nonclay bricks) | 1,587 | 1,508 |
| Nonrefractory | 1,752 | 2,096 |
| Diamond, gem, not set or strung carats | 215 | -- |
| Fertilizer materials: | | |
| Crude: | | |
| Nitrogenous | 200 | 2,016 |
| Phosphatic | 200 | 80 |
| Potassic | 7,380 | [2] -- |
| Manufactured: | | |
| Nitrogenous | 54,668 | 75,955 |
| Phosphatic including basic slag | r 34,651 | 30,899 |
| Potassic | 7,380 | 2,172 |
| Other, including mixed | r 52,986 | 30,119 |
| Ammonia | 49 | 119 |
| Graphite, natural | 62 | 26 |
| Lime | 172 | 275 |
| Magnesite | 2 | -- |
| Mica: | | |
| Crude, including splittings and waste | 12 | 13 |
| Worked, including agglomerated splittings value | $4,746 | $828 |
| Pigments, mineral including processed iron oxides | 1,164 | 2,212 |
| Precious and semiprecious stone, except diamond: | | |
| Natural value | $42,483 | $40,118 |
| Manufactured do | $21,747 | $21,342 |
| Salt and brine | 7,586 | 10,257 |
| Sodium and potassium compounds, n.e.s | 3,410 | 5,692 |
| Stone, sand and gravel: | | |
| Dimension stone, worked | 56 | 47 |
| Dolomite, chiefly refractory grade | 211 | 309 |
| Gravel and crushed rock | 705 | 185 |
| Limestone [3] | 3,717 | 3,988 |
| Quartz and quartzite | 3 | [4] -- |
| Sand, excluding metal bearing | 234 | 358 |
| Sulfur: | | |
| Elemental | 506 | 653 |
| Sulfuric acid | 719 | 947 |
| Other nonmetals, n.e.s.: | | |
| Crude value | $99,492 | $125,149 |
| Oxides and hydroxides, n.e.s do | $87,808 | $210,719 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 9,766 | 6,563 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Asphalt and bitumen, natural | 664 | 214 |
| Coal and briquets: | | |
| Anthracite and bituminous coal | 39,142 | 70,209 |
| Briquets of anthracite and bituminous coal | 46 | -- |
| Coke and semicoke | 1,269 | 1,216 |
| Hydrogen, helium, rare gases value | $56,665 | $16,503 |
| Peat, including briquets and litter | 2 | -- |

See footnotes at end of table.

**Table 3.—Kenya: Imports of major mineral commodities [1]—Continued**
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum: | | | |
| Crude and partly refined | thousand 42-gallon barrels | 18,401 | 38,409 |
| Refinery products: | | | |
| Gasoline | do | 665 | 492 |
| Kerosine and jet fuel | do | 495 | 466 |
| Distillate fuel oil | do | 473 | 61 |
| Lubricants | do | 498 | 485 |
| Mineral jelly and wax | do | 45 | 11 |
| Other | do | 29 | 24 |
| Mineral tar and other coal-, petroleum-, or gas-derived chemicals | 42-gallon barrels | 9 | 112 |

r Revised.
[1] Includes transfers from Uganda and Tanzania.
[2] One-hundred tons credited to Uganda were removed from Kenya leaving a negative balance.
[3] Includes gypsum, plasters, limestone flux and similar stone used for the manufacture of lime or cement.
[4] Fifty-five tons credited to Uganda were removed from Kenya leaving a negative balance.

## TANZANIA [4]

The production of diamond continued to dominate the mineral industry of Tanzania, accounting for over 90% of the total value of mineral exports.[5]

To help develop the Tanzania mining industry, the Government of Canada donated $1.5 million through the Canadian International Development Agency.[6] The grant, to be administered by the agency, provides for senior Canadian mining officials to fill top posts in the recently organized Tanzania State Mining Corp. while candidates from Tanzania are trained in Canada for the next 5 years to fill the posts. In addition, the grant will enable further assistance for mineral exploration in Tanzania by providing three diamond-drilling rigs and three master drillers who will train Tanzanian personnel.

[4] Prepared by Robert G. Clarke.
[5] Ministry of Commerce and Industries, Mineral Resources Division (Dodoma, Tanzania). Mineral Exports. Monthly Issues.
[6] Engineering and Mining Journal. Tanzania. V. 175, No. 4, April 1974, p. 163.

**Table 4.—Tanzania: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| METALS | | | | |
| Gold, refined | troy ounces | 213 | 56 | 71 |
| Silver, refined | do | 45 | 4 | 3 |
| Tin, mine output, metal content | long tons | 51 | 33 | 11 |
| Tungsten, mine output, metal content | | r 3 | 2 | 1 |
| NONMETALS | | | | |
| Cement | | 236,956 | 314,062 | 295,000 |
| Clays, kaolin | | 1,460 | 870 | 792 |
| Diamond: | | | | |
| Gem e [1] | carats | 326,023 | 250,730 | 249,006 |
| Industrial e [1] | do | 326,022 | 250,729 | 249,007 |
| Total | do | 652,045 | 501,459 | 498,013 |
| Gem stones, precious and semiprecious, except diamond: [2] | | | | |
| Amethyst | kilograms | 80 | 625 | 1,092 |
| Aquamarine | do | 3 | 797 | -- |
| Beryl (gem only) | do | 100 | 59 | 76 |
| Chrysoprase and opal | do | 31 | 88 | 211 |
| Corundum (gem only) | do | r 1 | ([3]) | 205 |
| Garnet | do | r 105 | 190 | 349 |
| Ruby and sapphire | do | 20 | 16 | 218 |
| Tourmaline | do | 9 | 9 | 9 |
| Zircon | do | 3 | 3 | 45 |
| Zoisite (tanzanite) | do | r 64 | 77 | 16 |
| Gypsum and anhydrite, crude | | 14,121 | 12,872 | 21,124 |
| Lime (quicklime and hydrated lime) | | 1,862 | 5,988 | 4,821 |
| Magnesite, crude | | 58 | 109 | -- |
| Meerschaum | | 30 | 10 | 3 |

See footnotes at end of table.

**Table 4.—Tanzania: Production of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Mica: | | | | |
| Sheet | | 18 | 32 | 9 |
| Scrap e | | 13 | 13 | 13 |
| Salt, all types | | 32,467 | 38,392 | 34,177 |
| Stone, sand and gravel: | | | | |
| Calcite | | -- | 21,965 | 2,164 |
| Ornamental stone: | | | | |
| Art stone | | r 9 | 2 | 41 |
| Amethystine quartz | | 30 | 186 | (3) |
| Glass sand | | 1,489 | 15,233 | 14,875 |
| Vermiculite | | -- | -- | 20 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Coal, bituminous | | 3,464 | 1,994 | 1,510 |
| Petroleum refinery products: | | | | |
| Gasoline | thousand 42-gallon barrels | 1,128 | 974 | 965 |
| Jet fuel | do | 459 | 445 | 485 |
| Kerosine | do | 148 | 148 | 148 |
| Distillate fuel oil | do | 1,299 | 1,289 | 1,258 |
| Residual fuel oil | do | 2,501 | 2,394 | 2,664 |
| Liquefied petroleum gas | do | 58 | 76 | 89 |
| Refinery fuel and losses | do | 369 | 337 | 213 |
| Total | do | 5,962 | 5,663 | 5,822 |

e Estimate. p Preliminary. r Revised.
1 Estimates based on reported total diamond output and best available information on ratio of gem to industrial stones in total output.
2 Exports, including transfers to Kenya and Uganda.
3 Less than ½ unit.

The State Mining Corporation, as a result of exploratory work in 1973, installed a pilot plant for processing beach sands at Silversands, just outside Dar es Salaam.[7] The plant is intended to process extensive ilmenite, rutile, and zircon-bearing sands along the Tanzanian coast. Teams of People's Republic of China (PRC) geologists arrived in Tanzania in the latter part of 1974 to conduct field studies for the State Mining Corporation which may lead to the development of an industry to utilize the coal and iron deposits in southern Tanzania.[8] If feasible, the project would be financed initially through a $75 million loan agreement made between the PRC and Tanzanian Governments in 1974.

A consortium of Japanese companies and Tanzanian interests planned to exploit the natural soda ash deposits of Lake Natron.[9] The Japanese companies include Japan's five major Solvay soda-ash producers, Asahi Glass Co., Ltd., Central Glass Co., Ltd., Toyo Soda Manufacturing Co., Ltd., and Tokuyama Soda Co., Ltd., and the large trading concern, Toyo Menka Kaisha, Ltd. Expansion of the soda-ash industry in Japan has been deterred because Japan has to import nearly all of its salt requirements. The Lake Natron operation would ease the problem for the Japanese producers.

## PRODUCTION AND TRADE

Available data on mineral production and trade are shown in tables 4-6.

## COMMODITY REVIEW

**Metals.**—*Gold and Silver.*—Production of gold increased and byproduct silver decreased. Exploration programs by a team from the U.S.S.R. continued at sites in the Mpanda, Chunya, and Songea areas. A preliminary development program for the Songea area was indicated to be by placer mining methods. The current price of gold is sufficiently high to justify reviewing gold mining operations which previously were too high in cost and were abandoned.

*Iron Ore.*—A team of geologists from the PRC conducted a feasibility study of known iron and coal deposits in southern Tanzania starting in late 1974.[10] The project would be financed initially through a $75 million loan agreement in 1974 between the PRC and Tanzanian Governments and would

[7] Mining Journal. Industry in Action. Tanzanian Mineral Programme. V. 284, No. 7293, May 30, 1975, pp 421–422.
[8] World Mining. Africa. Tanzania Chinese Geologists Prospect Iron Ore and Coal Deposits. V. 28, No. 4, April 1975, p. 79.
[9] Industrial Minerals. Tanzania. The Sun Rises over Lake Natron. September 1974, p. 33.
[10] Work cited in footnote 8.

include mine development, access railroad facilities, a coking plant, and an iron ore reduction plant.

**Nonmetals.**—*Cement.*—Production by the Tanzanian Portland Co. Ltd. at its Wazo Hill plant near Dar es Salaam was near capacity. The State Mining Corp. proposed a new cement plant to be built near the northern seaport of Tanga for which preliminary plans included a financing package. International sources were solicited for the project.

*Gem Stones.*—After diamond, exports of all other gem stones, as a group, ranked second in value in 1974. The gem minerals exported included amethyst, beryl, chrysoprase, opal, gem-corundum, garnet and rhodolite, ruby, sapphire, tourmaline, zircon, and gem zoisite (tanzanite).

The emerald deposit at Lake Manyara was discovered in 1970, and was operated by the Galai Mining Co. Ltd. until April 1972 during which time approximately 1 million carats of beryl classified as gem grade were mined.[11] The mine was nationalized in February 1973, and continued to operate on a small scale. The tanzanite mine, about 50 miles southeast of Mt. Kilimanjaro near Moshi, has also been nationalized and continued to operate on a small scale.

*Soda Ash.*—A feasibility study was finished in 1974 for the development of a natural soda ash plant at Lake Natron.[12] Five Japanese companies and the Government of Tanzania, in a joint venture, proposed an output of about 30,000 tons per year starting in 1980. The project would require the construction of roads and railways extending from Lake Trona to the east coast of Africa either to the port of Mombasa in Kenya or to Tanga in Tanzania. Half the output will be shipped to Japan and half to other countries in Europe and the Middle East.

**Mineral Fuels.**—*Coal.*—Coal reserves have been delineated by PRC geologists along the Uhuru Railway at Ruhuhu, Mchuchuma, and Ketewaka.[13] The State Mining Corp. announced that these deposits would be developed with the help of West Germany.

*Petroleum.*—Azienda Generale Italian Petroli (AGIP) S.p.A., a subsidiary of Italy's Ente Nazionale Idrocarburi (ENI), completed drilling of two offshore wells, one north of Bagamayo and the other in the delta of the Rufiji River. One of the wells showed gas but of insufficient quantity to justify further work in the selected areas. The Oceanic Exploration Co. of Denver, Colo., conducted discussions during 1974 with the Tanzanian Petroleum Development Corp. concerning seismic work in deeper waters off Tanzania from approximately latitude 4° 30' S to latitude 8° S, and ranging from 40° 15' E to 41° E.

[11] Gubelin, E. J. The Emerald Deposit at Lake Manyara, Tanzania. Lapidary J., v. 28, No. 2, May 1974, pp. 338–347, 359–360.
[12] Japan Chemical Week. Natural Soda Ash Venture in Tanzania Being Promoted. V. 15, No. 744, Aug. 1, 1974, p. 1.
[13] Work cited in footnote 7.

## Table 5.—Tanzania: Exports and reexports of mineral commodities[1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum including alloys, all forms | 564 | 1,990 |
| Gold, unworked or partly worked ... troy ounces | 100 | 15 |
| Iron and steel: | | |
| Scrap | 1,265 | 658 |
| Semimanufactures | 18,278 | 18,485 |
| Manganese ore and concentrate | 14 | 35 |
| Silver including alloys ... troy ounces | 14 | 2 |
| Tin ore and concentrate ... long tons | 76 | 51 |
| Tungsten ore and concentrate | 27 | -- |
| Other nonferrous scrap | 902 | 924 |
| NONMETALS | | |
| Cement | 19,522 | 11,735 |
| Clays and clay products (including refractory bricks) | 116 | 106 |
| Diamond, gem, not set or strung ... carats | 385,330 | 560,715 |
| Fertilizer, manufactured, n.e.s | 700 | 1,038 |
| Gypsum, plasters, etc | 3,978 | 3,534 |
| Lime | 134 | 216 |
| Magnesite | 484 | 105 |
| Mica, crude, including splittings and waste | 21 | 18 |
| Precious and semiprecious stones (except diamond), natural ... value | $89,715 | $541,309 |
| Salt and brine | 14,581 | 10,326 |
| Stone, sand and gravel, dimension stone, crude | 1 | 91 |
| Other nonmetals, crude ... value | $18,200 | $1,541 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Hydrogen, helium and rare gases ... do | $927 | $247 |
| Petroleum refinery products: | | |
| Gasoline ... thousand 42-gallon barrels | 1,654 | 613 |
| Kerosine ... do | 179 | 119 |
| Jet fuel ... do | 297 | 122 |
| Distillate fuel oil ... do | 2,392 | 983 |
| Residual fuel oil ... do | 1,447 | 914 |
| Liquefied petroleum gas ... do | 12 | 6 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | -- | 6 |

[1] Includes transfers to Kenya and Uganda.

## Table 6.—Tanzania: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum including alloys: | | |
| Unwrought | 2,322 | 4,002 |
| Semimanufactures | 541 | 815 |
| Copper including alloys, all forms: | | |
| Unwrought | -- | 6 |
| Semimanufactures | 225 | 363 |
| Gold, unworked or partly worked ... troy ounces | 1,444 | 843 |
| Iron and steel: | | |
| Ore and concentrate | 874 | 1,158 |
| Pig iron, ferroalloys, and similar materials | 1,086 | 1,330 |
| Steel, primary forms | 4,838 | 6,260 |
| Semimanufactures | 169,074 | 157,041 |
| Lead including alloys, all forms: | | |
| Unwrought | 110 | 190 |
| Semimanufactures | 177 | 17 |
| Manganese ore and concentrate | 270 | -- |
| Nickel metal including alloys, semimanufactures ... value | $1,904 | $4,071 |
| Platinum group including alloys ... do | $17 | $32 |
| Silver ... troy ounces | -- | 1,018 |
| Tin including alloys, all forms: | | |
| Unwrought ... long tons | 19 | 20 |
| Semimanufactures ... do | 12 | 3 |
| Zinc including alloys, all forms: | | |
| Unwrought | 1,990 | 3,228 |
| Semimanufactures | 419 | 767 |
| Other: | | |
| Nonferrous metal scrap | 72 | 89 |
| Oxides, hydroxides and peroxides of metals, n.e.s ... value | $24,191 | $163,658 |
| Base metals including alloys, all forms | 34 | 17 |
| NONMETALS | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | 193 | 100 |
| Grinding and polishing wheels and stones | 68 | 87 |
| Asbestos | 54 | 194 |
| Cement | 204,177 | 83,183 |
| Clays and clay products (including all refractory brick): | | |
| Crude clays, n.e.s | 804 | 1,074 |

See footnotes at end of table.

Table 6.—Tanzania: Imports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| NONMETALS—Continued | | |
| Clays and clay products (including refractory brick)—Continued | | |
| Products: | | |
| Refractory (including nonclay bricks) | 1,419 | 130 |
| Nonrefractory | 912 | 1,387 |
| Diamond: | | |
| Gem, not set or strung ---- thousand carats | 51 | 49 |
| Industrial ---- do | 69 | 127 |
| Feldspar and fluorspar | 344 | 99 |
| Fertilizer materials: | | |
| Crude, phosphatic | 26,800 | 38,770 |
| Manufactured: | | |
| Nitrogenous | 30,882 | 29,487 |
| Phosphatic | 10,716 | 4,474 |
| Potassic | 5,431 | 6,278 |
| Other, including mixed | 7,497 | 6,494 |
| Ammonia | 4,595 | 4,045 |
| Graphite, natural | 2 | 1 |
| Gypsum and plasters [2] | 74 | 110 |
| Lime | 579 | 386 |
| Magnesite | 7 | -- |
| Mica: | | |
| Crude, including splittings and waste | 8 | 17 |
| Worked, including agglomerated splittings ---- value | $33 | $1,292 |
| Pigments, mineral, iron oxides, processed | 8 | 1,688 |
| Precious and semiprecious stones ---- value | $11,433 | $105 |
| Salt and brine | 5,292 | 2,042 |
| Sodium and potassium compounds, n.e.s | 3,948 | 4,391 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude and partly worked | -- | 151 |
| Worked | 18 | 1 |
| Dolomite | -- | 10 |
| Gravel and crushed rock, n.e.s | 34 | 15 |
| Quartz and quartzite | 1 | 6 |
| Sand, excluding metal bearing | 72 | 119 |
| Sulfur: | | |
| Elemental | 9,701 | 21,355 |
| Sulfuric acid | 338 | 171 |
| Other nonmetals, n.e.s.: | | |
| Crude ---- value | $110,433 | $164,987 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | r 7,188 | 6,785 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Asphalt and bitumen, natural | 71 | 4 |
| Coal, anthracite and bituminous | 64 | 1,363 |
| Coke and semicoke | 4,099 | 228 |
| Hydrogen, helium, and rare gases ---- value | $116,529 | $75,682 |
| Petroleum: | | |
| Crude and partly refined ---- thousand 42-gallon barrels | 6,021 | 10,381 |
| Refinery products: | | |
| Gasoline ---- do | 1,482 | 958 |
| Kerosine ---- do | 332 | 396 |
| Jet fuel ---- do | 36 | 130 |
| Distillate fuel oil ---- do | 2,823 | 1,953 |
| Residual fuel oil ---- do | 262 | 227 |
| Lubricants ---- do | 165 | 170 |
| Other: | | |
| Liquefied petroleum gas ---- do | 6 | 14 |
| Mineral jelly and wax ---- do | 6 | 37 |
| Nonlubricating oils ---- do | 7 | 11 |
| Bitumen and other residues ---- do | 146 | 295 |
| Bituminous mixtures, n.e.s ---- do | 34 | 582 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 1,477 | 598 |

r Revised.
[1] Includes transfers from Kenya and Uganda.
[2] Includes gypsum, plasters, limestone flux, and similar stone used for the manufacture of limestone and cement.

## UGANDA [14]

The mainstay of the economy of Uganda is agriculture, from which over 90% of the population derive their livelihood. The mineral industry is a small part of the remaining segments of the economy and reports of the industry were not obtainable from the Government of Uganda on a regular basis. Most of the information for this chapter was derived indirectly from other sources such as the East African Community Monthly Trade Statistics.[15]

[14] Prepared by Robert G. Clarke.
[15] East African Community (Mombasa, Kenya). East African Customs and Excise Monthly Trade Statistics for Tanzania, Uganda, and Kenya, 1974. Monthly issues.

**Table 7.—Uganda: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| METALS | | | |
| Beryllium, beryl concentrate, gross weight | 62 | e 60 | e 54 |
| Bismuth, mine output, metal content kilograms | 3,960 | e 4,000 | e 4,000 |
| Columbium and tantalum, ore and concentrate, gross weight do | 1,800 | e 1,800 | e 3,600 |
| Copper: | | | |
| Mine output, metal content | r 15,736 | 15,657 | e 12,600 |
| Blister, primary | 14,168 | 9,692 | 8,900 |
| Iron and steel, ingots | 11,000 | 15,000 | 16,000 |
| Tin, mine output, metal content long tons | r 71 | 43 | 196 |
| Tungsten, mine output, metal content | r 117 | 89 | e 110 |
| NONMETALS | | | |
| Cement, hydraulic | 166,000 | 143,000 | 154,000 |
| Fertilizer materials, phosphatic: | | | |
| Crude, apatite | 15,000 | 18,000 | e 18,000 |
| Superphosphate | 23,000 | e 24,000 | NA |
| Lime (quicklime and hydrated lime) e | r 30,000 | r 30,000 | 30,000 |
| Salt, evaporated e | 3,000 | 3,000 | 3,000 |

e Estimate. p Preliminary. r Revised. NA Not available.

## COMMODITY REVIEW

**Metals.**—*Copper.*—According to the monthly trade statistics of the East African Community, the amount of blister copper exported was slighly less in 1974 than in 1973. The indications, therefore, were that production problems still dominated the copper industry.

*Tungsten.*—Exports of tungsten ore and concentrate were about the same in 1974 as in previous years according to trade statistics. From this, it may be deduced that the industry continued operations in spite of government management problems.

**Nonmetals.**—Information was not available on nonmetallic mineral industry activities.

**Table 8.—Uganda: Exports and reexports of mineral commodities [1]**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Beryllium, beryl ore and concentrate | 64 | 84 |
| Copper metal including alloys | 14,141 | 9,714 |
| Iron and steel metal including alloys, all forms | 4,934 | 1,081 |
| Tin ore and concentrate long tons | 102 | 66 |
| Tungsten ore and concentrate | 246 | 178 |
| Other: | | |
| Ores and concentrates: | | |
| Of titanium, vanadium, molybdenum, tantalum, zirconium | 7 | -- |
| Of base metals, n.e.s | 21 | 4 |
| Nonferrous metal scrap | 614 | 83 |
| NONMETALS | | |
| Abrasives, natural, pumice, emery, etc | 1 | -- |
| Asbestos, crude | 12 | |
| Cement | 169 | 12,248 |
| Clays and clay products, including all nonrefractory brick | 6 | 401 |
| Fertilizer materials, manufactured: | | |
| Nitrogenous | 20 | -- |
| Phosphatic | 23,406 | 17,290 |
| Other, including mixed | 2 | -- |
| Gypsum and plasters | 1 | -- |
| Lime | 20 | -- |
| Salt and brine | 1,192 | 224 |
| Sulfur, sulfuric acid | 731 | 962 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Hydrogen, helium and rare gas [2] value | $3,327 | $3,215 |
| Petroleum products: | | |
| Gasoline, including natural thousand 42-gallon barrels | 18 | 15 |
| Distillate fuel oil do | 1 | -- |
| Kerosine do | 5 | -- |

[1] Includes transfers to Kenya and Tanzania.
[2] Includes oxygen, nitrogen, hydrogen and rare gases.

## Table 9.—Uganda: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum metal including alloys, all forms | 1,393 | 675 |
| Copper metal including alloys, all forms | 413 | 381 |
| Gold metal, partly worked ____ troy ounces | -- | [2] 58 |
| Iron and steel: | | |
| Scrap | 6,930 | 2,823 |
| Pig iron, ferroalloys, similar materials | 82 | 133 |
| Steel, primary forms | 5 | 107 |
| Semimanufactures | 25,835 | 16,764 |
| Lead metal including alloys, all forms | 43 | ([3]) |
| Nickel metal including alloys, all forms | ([3]) | ([3]) |
| Tin metal including alloys, all forms ____ long tons | 10 | 7 |
| Zinc metal including alloys, all forms | 1,117 | 332 |
| Other: | | |
| Nonferrous metal scrap | 23 | -- |
| Metallic oxides, chiefly used in paints | 204 | 179 |
| Other inorganic bases and metallic oxides, hydroxides and peroxides, n.e.s ____ value | $2,869 | $15,746 |
| Miscellaneous nonferrous base metals | 1 | ([3]) |
| NONMETALS | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | 92 | 342 |
| Grinding and polishing wheels and stones | 17 | 7 |
| Asbestos | 1,094 | 645 |
| Cement | 37,434 | 5,357 |
| Clays and clay products, including all refractory brick: | | |
| Crude clays, n.e.s | 603 | 251 |
| Products: | | |
| Refractory (including nonclay bricks) | 1,876 | 1,128 |
| Nonrefractory | 352 | 214 |
| Feldspar and fluorspar | 509 | 656 |
| Fertilizer materials: | | |
| Crude: | | |
| Phosphatic | 1 | -- |
| Potassic | -- | 100 |
| Manufactured: | | |
| Nitrogenous | 5,156 | 4,930 |
| Phosphatic | 973 | 166 |
| Potassic | 2,992 | 1,420 |
| Other, including mixed | 3 | 4,474 |
| Ammonia | 17 | 6 |
| Graphite, natural | 5 | 3 |
| Lime | 8 | 309 |
| Precious and semiprecious stones, except diamond, natural ___ value | $691 | -- |
| Salt and brine | 34,477 | 28,884 |
| Sodium and potassium compounds | 2,679 | 2,782 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude and partly worked | 23 | 3 |
| Worked | 65 | 11 |
| Dolomite, refractory grade | 147 | 496 |
| Gravel and crushed rock, n.e.s | 207 | 151 |
| Limestone [4] | 2,133 | 2,364 |
| Quartz and quartzite | 7 | 11 |
| Sand, excluding metal bearing | 39 | 1 |
| Sulfur: | | |
| Elemental | 5,472 | 2,124 |
| Sulfuric acid | 10 | 1 |
| Other nonmetals, n.e.s.: | | |
| Crude ____ value | $65,557 | $104,500 |
| Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s | 361 | 254 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Coal, anthracite and bituminous | 40 | -- |
| Coke and semicoke | 323 | 223 |
| Hydrogen, helium and rare gases [5] ____ value | $6,429 | $7,236 |
| Petroleum refinery products: | | |
| Gasoline (including natural) ____ thousand 42-gallon barrels | 1,033 | 1,018 |
| Kerosine ____ do | 314 | 348 |
| Jet fuel ____ do | 591 | 337 |
| Distillate fuel oil ____ do | 709 | 711 |
| Residual fuel oil ____ do | 599 | 484 |
| Lubricants ____ do | 58 | 58 |
| Other: | | |
| Liquefied petroleum gas ____ do | 267 | 31 |
| Mineral jelly and wax ____ do | 3 | 1 |
| Nonlubricating oils, n.e.s ____ do | 2 | 2 |
| Bitumen and other residues ____ do | 65 | 38 |
| Bituminous mixtures ____ do | 16 | 5 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 319 | 440 |

[1] Includes transfers from Kenya and Tanzania.
[2] Includes gold bullion.
[3] Less than ½ unit.
[4] Includes gypsum, plasters, limestone flux and similar stone used for the manufacture of lime and cement.
[5] Includes oxygen and nitrogen.

# The Mineral Industry of North Korea

By Richard H. Singleton [1]

In 1974 North Korea completed the first 4 years of its 6-year plan. Under the plan, industrial output had increased 17% per year on the average, according to government statements. The reported 1974 increase was 17.2%. During the 4 years, iron and steel furnaces were rebuilt and expanded; more large, modern sintering ovens and coke batteries were built at iron and steelworks; the Musan mine and other iron mines were further expanded; ore-dressing plants were modernized; and several new chemical fertilizer plants were built. Also the country's first oil refinery was reported to have been built and placed in operation.

Requirements laid down for 1974 included improvement of mining methods, greater production from the moderate-sized integrated steel industry, and accelerated development of the cement and chemical fertilizer industry. Greater emphasis on foreign trade continued, but this caused a large increase in North Korea's trade deficit.

For the mineral industry, objectives were listed as follows, in million tons:

| Commodity | 1970 output e | 1973 output e | 1976 goal of 6-year plan |
|---|---|---|---|
| Steel ingot and castings | 2.2 | 2.6 | 3.8–4.0 |
| Nonferrous metals | .16 | .24 | .45 |
| Coal | 27.5 | 37.2 | 50–53 |
| Cement | 4.0 | 5.8 | 7.5–8.0 |
| Chemical fertilizers | 1.5 | 2.0 | 2.8–3.0 |

e Estimated.

## PRODUCTION

North Korea produced a variety of mineral commodities in 1974, with coal, iron ore, lead, zinc, tungsten, barite, graphite, magnesite, and talc considered to be significant by world production standards. It was reported that more than 70% of the country's mineral raw material requirements was met domestically.

Production of iron and steel reportedly increased significantly in 1974. Production of phosphate fertilizer reportedly doubled. Production of hydraulic cement increased greatly. However, production statistics on these commodities were not released. Greatly accelerated production was planned for 1975 so that the 6-year plan goal could be realized one year early, in October 1975 to commemorate the 30th anniversary of the establishment of the Korean Worker's Party.

[1] Physical scientist, Division of Nonmetallic Minerals.

Table 1—North Korea: Estimated production of mineral commodities
(Thousand metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Cadmium, smelter output ---------- metric tons -- | 110 | 110 | 110 |
| Copper: | | | |
| Mine output, metal content ---------- | 13 | 13 | 15 |
| Metal, refined primary ---------- | 13 | 13 | 15 |
| Gold, mine output, metal content ------ thousand troy ounces -- | 160 | 160 | 160 |
| Iron and steel: | | | |
| Iron ore and concentrate ---------- | 8,600 | 8,900 | 11,000 |
| Pig iron and ferroalloys [2] ---------- | 2,600 | 2,700 | 3,300 |
| Steel, crude ---------- | 2,500 | 2,600 | 3,200 |
| Steel semimanufactures ---------- | 2,300 | 2,400 | 2,500 |
| Lead: | | | |
| Mine output, metal content ---------- | [r] 80 | 90 | 100 |
| Metal, primary ---------- | 75 | 80 | 95 |
| Nickel metal, primary ---------- | 1 | 1 | 1 |
| Silver, mine output, metal content ---- thousand troy ounces -- | 700 | 700 | 700 |
| Tungsten, mine output, metal content ---------- metric tons -- | 2,150 | 2,150 | 2,150 |
| Zinc: | | | |
| Mine output, metal content ---------- | [r] 150 | 160 | 162 |
| Metal, primary ---------- | 120 | 130 | 130 |
| **NONMETALS** | | | |
| Barite ---------- | 120 | 120 | 150 |
| Cement, hydraulic ---------- | 5,300 | 5,800 | 8,000 |
| Fertilizer, crude, natural phosphate ---------- | 300 | 360 | 700 |
| Fluorspar ---------- | 30 | 30 | 30 |
| Graphite ---------- | 75 | 75 | 75 |
| Magnesite: | | | |
| Crude ---------- | 1,800 | 1,800 | 2,000 |
| Clinker ---------- | 900 | 900 | 1,100 |
| Pyrite and pyrrhotite (including cuprous): | | | |
| Gross weight ---------- | 500 | 500 | 500 |
| Sulfur content ---------- | 200 | 200 | 200 |
| Salt, all types ---------- | 550 | 550 | 550 |
| Talc, soapstone, steatite, pyrophyllite ---------- | 100 | 110 | 120 |
| **MINERAL FUELS AND RELATED MINERALS** | | | |
| Coal: | | | |
| Anthracite ---------- | 27,300 | 30,000 | 33,000 |
| Bituminous [3] ---------- | 6,700 | 7,000 | 7,900 |
| Total ---------- | 34,000 | 37,000 | 40,900 |
| Coke ---------- | 2,200 | 2,200 | 2,200 |

[p] Preliminary. [r] Revised.
[1] In addition to the items listed, a number of other mineral commodities apparently are produced, but information is inadequate to make reliable estimates of output levels. These include (but are not limited to) antimony, arsenic (in arsenopyrite), asbestos, beryl, bismuth, boracite, china clay (kaolin), chromium, cobalt, columbite, germanium, indium, lithium minerals (lepidolite), manganese ore, mica (phlogopite), molybdenite, monazite, selenium, tellurium, titanium minerals (ilmenite and rutile), zircon, and a variety of crude construction materials including miscellaneous clays, glass sand, building sand, stone, and gravel.
[2] Includes granulated iron.
[3] Includes lower-rank coal including lignite.

## TRADE

Despite its goal of chuche (self-sufficiency), North Korea maintained its trade with the outside world. Japanese researchers claimed that the chuche policy has been disappointing and has caused North Korea to lag behind its southern neighbor technologically. North Korea's trade deficit quadrupled during 1974, to $430 million according to the Japan External Trade Organization. This was caused primarily by price rises of oil imported from the People's Republic of China (PRC) and the U.S.S.R., and by price decreases for raw mineral products exported by North Korea. This deficit may cause the country to look again to its central economy neighbors for support.

North Korea's mineral-industry exports to Japan increased by approximately 30% in 1974, to a total of approximately $60 million. Trade with Japan accounted for 40% of the trade with market economy countries. Commodities exported to Japan during 1974 were, in decreasing monetary value, pig iron, zinc, silver, anthracite coal, iron ore, lead, and magnesite. Japan received only 61% of the 500,000 tons of iron ore that they sought from North Korea during 1974. Mineral-industry imports from Japan during 1974 increased sharply, to $55 million, and comprised, principally, steel shapes such as sheet and rod. North

Korea reportedly attempted to procure 500,000 tons of structural steel shapes from Japan in 1974 for their burgeoning industry but were able to receive only one-third of this amount. Further trade growth with Japan and the remainder of the market economy world was hampered by North Korea's growing trade deficit.

North Korea's mineral-industry exports to the U.S.S.R. increased 8% in 1974, to a total value of $111 million. The principal commodities exported were, in descending order of monetary value, iron and steel products, magnesite, zinc, cement, lead, barite, talc, and nitrogen fertilizers. Iron and steel products comprised over 50% of these exports, and 90% of the products was rolled steel. Major mineral-industry commodities imported during 1974 from the U.S.S.R. were, in descending order of monetary value, petroleum, bituminous coal, coke (from coal), ferroalloys, steel products, aluminum, and asbestos. These imports had a total value of $53 million, 81% of which was mineral fuels.

North Korea's trade with the West had shown a phenomenal growth since the early 1970's, and during 1974 reportedly accounted for nearly 50% of its total trade. Imports of plant and machinery from the West increased greatly with the inception of the 6-year plan in 1970. A trade protocol was signed in 1974 with Iran involving $700 million over a 5-year period. Exports, including cement, steel, chemical fertilizers, and minerals, would be exchanged for Iranian oil. Certain credits would be extended to North Korea by Iran. A trade protocol was signed with Poland increasing trade by 15%. Trade was to include shipments of coke and chemicals to North Korea in exchange for items including calcined magnesite and steel.

**Table 2.—North Korea: Apparent exports of selected mineral commodities [1]**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Cadmium | 33 | 34 | All to U.S.S.R. |
| Copper and alloys, all forms | 1,040 | 2,731 | West Germany 1,721; Belgium-Luxembourg 894. |
| Iron and steel: | | | |
| Iron ore and concentrate | 527,081 | 423,348 | All to Japan. |
| Pig iron and cast iron | 135,702 | 107,139 | Japan 77,439; U.S.S.R. 29,700. |
| Ferroalloys | 3,295 | 1,242 | All to U.S.S.R. |
| Steel: | | | |
| Primary forms | NA | 6,627 | All to Japan. |
| Semimanufactures | 96,300 | 100,108 | Mainly to U.S.S.R. |
| Lead metal and alloys, all forms | r 34,988 | 37,840 | West Germany 14,833; U.S.S.R. 9,585; Japan 7,206. |
| Silver unworked and partly worked value, thousands | $5,847 | $7,322 | Japan $6,022; West Germany $1,300. |
| Tungsten ore and concentrate | 17 | 23 | All to France. |
| Zinc: | | | |
| Ore and concentrate | 3,508 | 2,822 | All to U.S.S.R. |
| Metal and alloys, all forms | r 54,933 | [2] 65,729 | Belgium-Luxembourg 16,470; Japan 16,172; U.S.S.R. 9,647. |
| Other metals and alloys, all forms | 89 | 134 | U.S.S.R. 50; West Germany 45; Belgium-Luxembourg 39. |
| NONMETALS | | | |
| Barite | 72,100 | 83,444 | All to U.S.S.R. |
| Cement | 428,000 | 495,290 | U.S.S.R. 480,000; Japan 15,290. |
| Feldspar and fluorspar | 10,198 | 7,288 | All to Japan. |
| Fertilizer materials, crude, nitrogenous | 15,000 | 15,700 | All to U.S.S.R. |
| Graphite | 9,351 | 17,513 | All to Japan. |
| Magnesite | r 522,582 | 524,901 | U.S.S.R. 404,135; Poland 53,118; Japan 41,564. |
| Quartz and quartzite | 1,971 | 3,855 | All to Japan. |
| Talc, soapstone, and steatite | 86,236 | 101,281 | Japan 54,897; U.S.S.R. 34,930; Poland 11,454. |
| Other nonmetals, slag and similar materials from steel manufactures | 36 | 63 | All to Japan. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal and coal briquets | 61,667 | 46,056 | Do. |

r Revised. NA Not available.

[1] Compiled from the import data of Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, West Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, U.S.S.R., United Kingdom, and Yugoslavia.

[2] Total excludes exports worth $185,000 exported to Austria.

Source: For 1972—Official import statistics of Poland, Romania, and the U.S.S.R., and for all other countries 1972 edition of: Statistical Office of the United Nations, Supplement to the World Annual. V. 5, Walker and Company, New York, 1974. For 1973—Official import statistics of Poland, Romania, and the U.S.S.R. and for all other countries 1973 edition of: Statistical Office of the United Nations, World Trade Annual. Vs. I, II, and III, Walker and Company, New York, 1975.

## Table 3.—North Korea: Apparent imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum metal and alloys, unwrought and semimanufactures | 1,308 | 1,788 | U.S.S.R. 1,715; Japan 73. |
| Chromium and chromite, ore and concentrate | 21,000 | 11,000 | All from U.S.S.R. |
| Copper ore and concentrate | 3,050 | -- | |
| Iron and steel: | | | |
| Ferroalloys | r 7,466 | 6,848 | U.S.S.R. 6,700; Japan 148. |
| Semimanufactures | 29,097 | 116,820 | Japan 61,752; West Germany 43,483; U.S.S.R. 9,716. |
| Lead ore and concentrate | 1,466 | -- | |
| Manganese ore | 21,000 | 21,000 | All from U.S.S.R. |
| Zinc ore and concentrate | -- | 10,750 | All from Japan. |
| Other: | | | |
| Oxides, hydroxides and peroxides of metals | 57 | -- | |
| Nonferrous metal and alloy semimanufactures | 253 | 275 | All from U.S.S.R. |
| **NONMETALS** | | | |
| Asbestos | 4,416 | 4,681 | Do. |
| Fertilizer materials, potassium salts | -- | 43,200 | Do. |
| Sulfur, elemental | 7,094 | 6,544 | Do. |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Carbon black | 3,400 | -- | |
| Coal, all grades ----- thousand tons | 356 | 269 | All from U.S.S.R. |
| Coke ---------- do | 135 | 122 | Do. |
| Hydrogen, helium and rare gases | 9 | -- | |
| Petroleum, crude and refinery products thousand tons | 398 | 585 | All from U.S.S.R. |
| Petroleum-, coal-, and gas-derived crude chemicals ---------- do | 10 | 10 | Do. |

r Revised. NA Not available.

[1] Compiled from the export data of Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, West Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, U.S.S.R., United Kingdom, and Yugoslavia.

Source: For 1972—Official export statistics of Poland, Romania, and the U.S.S.R., and for all other countries 1972 edition of: Statistical Office of the United Nations, Supplement to the World Trade Annual. V. 5, Walker and Company, New York, 1974. For 1973—Official export statistics of Poland, Romania and U.S.S.R. and for all other countries 1973 edition of: Statistical Office of the United Nations, World Trade Annual. V's. I, II, and III, Walker and Company, New York, 1975.

## Table 4.—North Korea: Exports to U.S.S.R. and Japan

(Thousand metric tons unless otherwise specified)

| Commodity | Japan | | U.S.S.R. | |
|---|---|---|---|---|
| | 1973 | 1974 | 1973 | 1974 |
| **METALS** | | | | |
| Cadmium ---------- metric tons | NS | NS | 84 | 78 |
| Steel | 7 | NS | 100 | 112 |
| Iron | 77 | 85 | 31 | 21 |
| Iron ore | 423 | 305 | NS | NS |
| Ferrosilicon | NS | NS | 1.2 | 2.6 |
| Lead | 7.2 | 9.0 | 9.6 | 15.8 |
| Silver ---------- million troy ounces | 2.61 | 2.66 | NS | NS |
| Zinc | 16.2 | 11.5 | 9.6 | 18.4 |
| **NONMETALS** | | | | |
| Barite | NS | NS | 83 | 100 |
| Cement | 15 | NS | 480 | 345 |
| Fluorspar | 7.3 | 5.7 | NS | NS |
| Graphite, crystalline | .3 | .6 | NS | NS |
| Graphite, amorphous | 17.2 | 19.5 | NS | NS |
| Magnesite | 42 | 65 | 404 | 389 |
| Nitrogen fertilizers | NS | NS | 16 | 15 |
| Soapstone | 28 | 18 | NS | NS |
| Talc | 27 | 23 | 35 | 49 |
| **MINERAL FUELS** | | | | |
| Anthracite coal | 46 | 237 | NS | NS |

NS Not significant.

## COMMODITY REVIEW

### METALS

**Iron Ore and Steel.**—Work continued on building the 60-mile pipeline from the Musan mine to the Kimchaek steelworks in North Hamgyong Province, to transport iron concentrates now carried by rail. Capacity of the Musan mine was expanded to 4.5 million tons per year. Further expansion of this mine, one of the largest in Asia, continued with a reported goal of 5.5 million tons capacity by 1975. Other reported large iron ore mines were Chaeryong, Unyul, and Hasong in South Hwanghae Province, and Tokhyon in North P'yongan Province. Magnetite was mined in the eastern coastal area and northern inland areas, limonite and siderite in the western coastal area, and hematite in South Hamgyon Province. Reportedly, the capacity of the Tokhyon mine was increased and new mines were developed at Toksong and Sohae-ri. Prospecting had, reportedly, roughly doubled the estimated iron ore reserves in North Korea to about 5 billion tons. The Musan complex alone had an estimated reserve of over 1 billion tons of high-grade magnetite ore.

North Korea's exports of iron ore to Japan decreased to 305,000 tons in 1974, from an average of over 500,000 tons per year between 1969 to 1973.

The iron and steel industry expanded considerably in 1974, and attainment of the 6-year plan goal of 3.8 million to 4.0 million tons of steel per year will reportedly be met 1 year early, in 1975. Annual production of pig iron, granulated iron, and steel reportedly each increased significantly in 1974. Exports of pig iron to Japan increased slightly in 1974, to 85,000 tons. Exports of iron and steel products to the U.S.S.R. increased in 1974 by 5%, to 133,000 tons, nearly 80% of which was in the form of rolled steel. Imports of steel shapes from Japan approximately doubled in 1974, to 140,000 tons.

A large blast furnace with a capacity of 1 million tons of pig iron per year was installed at the Kimchaek works, on the northeastern coast. The U.S.S.R. provided assistance on this project. The Kimchaek expansion, one of the largest construction projects in North Korea, included a continuous-sintering furnace, a coking furnace, a large electric converter, and a continuous-casting bay. Expansion of this complex was continuing with installation of an ore-concentrate conveyer system, a fourth coking furnace, and a mill to produce hot- and cold-rolled products.

There were a number of other developments in the steel industry. At the major Hwanghae steel complex south of P'yongyang, production of sintered ore, pig iron, and steel increased by approximately 50% during 1974. In another leading complex, the Kangson steelworks near P'yongyang, a No. 2 steel shop, including a large blooming mill, was built and a cableway with a capacity of transporting more than 100,000 tons of coal per year from a mine to the ironworks was constructed. Both the Hwanghae and the Kangson steelworks improved control and efficiency through automation and were undergoing further modernization.

Production at the Ch'ongjin steelworks during 1974 reportedly reached the 1976 goal through innovations, better control, and automation. A No. 3 steel shop, including rolling and forging equipment, was built. Output of the major crude product, granulated iron, increased by 74% in 1974.

**Nonferrous Metals.**—Rich deposits of gold, silver, copper, nickel, zinc, lead, cadmium, tin, molybdenum, and tungsten were reported to exist in North Korea and all of these, except tin and molybdenum, were known to have been converted to metal. Production of lead and zinc each comprised 2% and 3%, respectively of world production. About one-tenth each of lead and zinc production was exported to Japan and about one-sixth each to the U.S.S.R. in 1974. Production of tungsten equaled about 6% of world production and almost all of this was consumed domestically. Most of the cadmium produced apparently was exported to the U.S.S.R. during 1974.

Plans to build a new nonferrous mining and smelting complex near T'anchon and a mine near Hyesan were reported. Mines at Sohung, Komdock, and Songch'on and smelters at Nampo, Haeju, and Munp-yong were being expanded. Tonnages of beneficiated ore increased 40% at Munp'yong in 1974.

### NONMETALS

**Cement.**—A 3-million-ton-per-year cement production complex was reportedly in full operation in 1974 at Sunch'on in South P'yongan Province. This accounted

for nearly one-half of domestic cement production. Construction of extensive cement production facilities throughout North Korea was begun or planned. A doubling of production at the Sunch'on facility was planned for 1975 through plant enlargement. A similar 3-million-ton-per-year expansion was planned in 1975 on the West coast at Haeju. Construction of a larger 5-million-ton-per-year plant in the Ch'onnae-ri area of Kangwon Province was planned. Smaller cement plants at Pongsan, Komusan, and Majong, were being enlarged. These expansions would provide sufficient capacity to exceed the 1976 annual planned production goal of 7.5 million tons. Approximately 5% of domestic production was exported to the Soviet Far East during 1974.

**Fertilizer Materials.**—Production of phosphate fertilizers during 1974 nearly doubled compared with 1973 and North Korea reportedly had become self-sufficient in this commodity. Six new phosphate mines were activated, at Chungsan, Pungnyon, Sangnyong, Taedaeri, Unsan, and Yongyu. Phosphate production was increased at the Chongsi plant and ammonium phosphate production was increased at the Aoji plant through expansion of facilities. A further 50% increase in phosphate fertilizer production was scheduled for 1975.

One million tons of various types of fertilizers was produced during 1974 at the Hungnam fetrilizer complex. This accounted for nearly one-half of fertilizer production in North Korea. Production capacity of the ammonia synthesizing tower at Hungnam was increased 50% through redesign. Nitrogenizing-kiln capacity was doubled by process innovations and remodeling and lime-nitrogen fertilizer production was expanded at the Sunch'on plant. Two new urea plants were partially built, one at the Ch'ongnyon chemical plant and a 360,000-ton-per-year-capacity unit at the Youth Chemical Factory in west North Korea.

Total fertilizer production in North Korea during 1974 reportedly increased 40% above the 1973 level. It was stated that the 1976 6-year plan production goal of 3 million tons per year would be reached in 1975, and that 2.15 million tons of fertilizer would be supplied to the countryside during 1975. Planned investments in 1975 were stated to be more than double that of 1974.

**Magnesite.**—Magnesite mining, beneficiation, and sintering continued as a major industry yielding approximately 2 million tons of material in 1974. Approximately 20% of this was exported to the U.S.S.R. and 3% to Japan. Exports to Poland were planned in 1975 as part of a trade agreement. A 200,000-ton-per-year magnesite beneficiation and sintering plant, to be built in Chongjin, was reportedly ordered from a West German-Austrian consortium. Startup for the $51 million plan was scheduled for 1977.

**Other Nonmetals.**—A significant quantity of graphite, equivalent to approximately 20% of world production, continued to be produced. Much of this output was a low-grade amorphous material that was burned as fuel. Approximately 25% of this graphite, mostly the low-grade material, was exported to Japan. Barite production equaled 3% of world output and approximately two-thirds of this was exported to the U.S.S.R. The talc-group minerals were mined in amounts equivalent to 2% of world production. About 75% of the talc-group minerals was exported, to the U.S.S.R. and Japan. Production of fluorspar probably did not exceed 30,000 tons. Shipments of metallurgical-grade fluorspar were made to Japan.

## MINERAL FUELS

**Coal.**—Modest gains were made in the coal mining industry in 1974 with an overall production increase of approximately 10% over that of 1973, to 41 million tons. The large Anju anthracite mine, South P'yongan Province, was expanded and the Sinch'ang mine, the Nation's leading coal producer, was similarly expanded and rebuilt. Six-year plan production goals were reached 2 years ahead of schedule at the Yongmun mine in the western area and at the Chollima Sinch'ang mine where significant progress was made in modernization. Many new mines were opened in 1974.

Anthracite exports to Japan increased by a factor of 5, to 237,000 tons, in 1974. Approximately 230,000 tons of bituminous coal and 110,000 tons of coke, from coal, were imported from the U.S.S.R. during 1974.

The 1976 target for coal output remained at 50 million to 53 million tons, of which over 10 million tons is to be produced by medium- and small-size mines.

**Petroleum.**—Approximately 1 million tons of petroleum was imported from the U.S.S.R. and the PRC, respectively, during

1974 and these presumably met domestic requirements. The country's first oil refinery was reported to have been put into operation and a petrochemical plant was reportedly built in the western part of the country. A trade protocol was signed with Iran in Pyonyang late in 1974. The agreement would involve oil exports to North Korea valued at approximately $200 million per year over a 5-year period. It was reportedly planned to build a 2-million-ton-per-year oil refinery by 1976.

# The Mineral Industry of the Republic of Korea

By Harold J. Drake [1]

The rapid expansion of the economy of the Republic of Korea in recent years cooled off somewhat in 1974. The gross national product (GNP), at current prices, rose 41% to 6,943 billion won ($17.2 billion)[2] but much of the increase was due to higher prices. Real growth, as measured in constant 1970 prices, amounted to 8.2% and sent the GNP up to 3,810 billion won ($9.4 billion) from 3,523 billion won ($8.8 billion) in 1973. The value of manufacturing, in constant 1970 prices, rose 16% to 1,160 billion won ($2.9 billion), and the value of mining and quarrying operations rose 5% to 38.6 billion won ($96 million). With 1970 equal to 100, the index for industrial production stood at 225 compared with 176 in the preceding year. Similar gains were reported for the manufacturing component of industrial production, which rose to 238 from 184, and for the mining component, which rose to 125 from 114.

The principal mining sectors reporting increased outputs were anthracite, tungsten, copper, gold, kaolin, and limestone. Those sectors reporting declines were zinc, talc, fluorspar, lead, and refined silver. Producers of fertilizers, petroleum products, iron and steel, cement and nonferrous smelter products all reported increased output.

Production indexes (1970=100) for some of the major mining and mineral processing sector components for the last 2 years, are as follows:

| | 1973 | 1974 |
|---|---|---|
| Petroleum products | 139 | 138 |
| Industrial chemicals | 135 | 152 |
| Cement | 141 | 153 |
| Anthracite coal | 110 | 123 |
| Metal mining | 102 | 106 |
| Nonmetal mining | 158 | 150 |
| Tungsten mining | 102 | 141 |

Inflation accelerated in 1974. The wholesale price index (1970=100) for all commodities rose 42% to 188 compared with the 7% increase that occurred in 1973. The index for all minerals stood at 213 in 1974 compared with 126 in 1973; for metallic ores, at 219 compared with 134 in 1973; and for nonmetallic ores, at 203 compared with 112 in the preceding year.

The Government of the Republic of Korea sought to assist the heavy and chemical industries, including the mining industry and the electric power industry, by enacting legislation that established the National Investment Fund (NIF). The 1974 NIF plan was set at 90 billion won, approximately one-half of which was for the heavy and chemical industries. The mining industry was allotted one-half billion won under the plan. The Government planned investment of $1 billion between 1973 and 1981 in a major expansion of its machinery industry should provide additional incentives to the mining industry. The plan calls for the establishment of large new industrial complexes throughout Korea. For the machinery industry, the site chosen was Changwon near the port city of Pusan. The first project in 1974 was the construction of a special alloy steel plant.

Progress continued on the Government's planned expansion of its major heavy and chemical industries. Capacity of the iron and steel plant at Pohang was to be increased from 1,032,000 tons of crude steel to 2,600,000 tons, and to this end, construction of an ironmaking plant, a coke plant, and certain supportive facilities

[1] Physical scientist, Division of Nonmetallic Minerals.

[2] Where necessary, values have been converted from Korean won (W) to U.S. dollars at the rate of W398.3=US$1.00 (1973) and W404.5=US $1.00 (1974).

were begun. In addition, loans were approved for a hot strip and continuous casting project and a blooming and slabbing plant. Expansion of the nonferrous metal industry by the establishment of copper, zinc, lead, and aluminum smelters was in its first stage. Project planning for a 100,000-ton copper smelter and an 80,000-ton zinc smelter at the Onsan Industrial Complex was completed and approved by the Government. The lead and aluminum smelters are to be established in the second stage of the expansion program. Onsan was also the location for the establishment of two new oil refineries, each with a first stage capacity of 150,000 barrels per stream day and a similar capacity for their second stage. Both projects, one by Sunkyong Development Co., Ltd., the other by Cho Yang Shipping Co., Ltd., were still in the planning and negotiating stages in 1974.

A major petrochemical complex at Yosu was under development with the design of a naphtha-cracking plant and a caprolactum plant. A new fertilizer plant with a capacity of 100,000 tons of ammonia and 100,000 tons of complex fertilizers, included in the industrial and chemical expansion plan, was being designed, and land was being reclaimed at the plant site. Preliminary approval was granted by the Government for Ssangyong Cement Manufacturing Co., Ltd., to erect a cement plant at Onsan with a first stage capacity of 100,000 tons and a second stage capacity of 50,000 tons. Construction began in 1974 and was to be completed in 1976.

The Government of the Republic of Korea recently revised its long-term energy plan. The new plan called for the investment of $7.5 billion through 1981 to develop domestic energy resources and nuclear power. Construction of atomic and electric powerplants and a sharp expansion of coal mining and transportation facilities will be emphasized. New oil refineries are planned, but their output would be for the petrochemical industry rather than for energy uses. Coal production is to rise to 24 million tons by 1981, and imports, to 10 million tons.

## PRODUCTION

In 1974, declining export demand, one of the principal markets for Korean minerals, led to a reduced rate of expansion of output for the mining industry as a whole. In contrast to the 1973 growth of 18%, in constant 1970 prices, output increased only 5% to 38.6 billion won ($96 million). Inflation was readily apparent in the 47% growth in value of output based on current prices.

Production of anthracite coal increased 13% to 15.3 million tons, and production of tungsten was up 37% to 2,793 tons. Shipments of tungsten ore, however, declined 4% to 4,433 tons because export demand waned during most of 1974. Production of amorphous graphite increased 142% to 103,201 tons. As in past years, the Republic of Korea was one of the world's leading producers of these commodities.

Significant products of nonferrous metal mining and processing were copper, lead, and zinc. Mine output of copper ore increased 35%, whereas that of lead ore declined 15%, and that of zinc ore declined 13%. Refining operations fared somewhat better than mining operations. Production of copper ingot increased 34%, and shipments, 27%. Output of pig lead declined only 1%, and shipments, only 5%. Zinc refining operations fared the worst of the three. Output was off 8%, shipments were down 22%, and inventories were 8 times the level of 1973.

In response to higher prices, output of gold increased 64% but silver was off 12%. Iron ore output rose 6%, and production of pig iron nearly doubled. Of the principal products of nonmetallic mining, output of kaolin was up 30%; limestone, up 13%; agalmatolite, off 7%; and talc, off 8%. Products of the processing sector of the nonmetallic mineral industry were generally produced at a rate well above that of 1973. Urea fertilizer production was up 16%; fused magnesium phosphate fertilizer, up 10%; and compound fertilizer, up 4%. Nearly every fertilizer plant was reported operating in 1974 at between 115% and 120% of design capacity. Production of hydraulic cement was 8% above that of 1973.

Petroleum refining operations were curtailed somewhat by turbulent conditions in the world petroleum industry upon

which the Republic of Korea depends for its feedstock. Production of residual fuel oil was up 2%, and production of distillate fuel oil up 3%. Gasoline production declined 32% while that of jet fuel and kerosine was off 2%.

**Table 1.—Republic of Korea: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| METALS | | | |
| Aluminum metal, primary | 15,162 | 16,600 | 18,000 |
| Antimony, mine output, metal content | [r] 3 | 11 | [e] 10 |
| Arsenic, mine output, white arsenic equivalent | 2 | 141 | 16 |
| Bismuth, metal | 90 | 99 | 131 |
| Cerium, metallic kilograms | 1,500 | 12,000 | 88,000 |
| Copper: | | | |
| Mine output, metal content | [r] 842 | 956 | 1,294 |
| Smelter | 10,300 | [e] 10,400 | 12,400 |
| Metal, refined, including secondary | 9,061 | 9,246 | 12,399 |
| Gold, metal [1] troy ounces | [r] 17,136 | 14,275 | 23,406 |
| Iron and steel: | | | |
| Iron ore and concentrate, gross weight thousand tons | [r] 414 | 466 | 493 |
| Pig iron do | [r] -- | 455 | 987 |
| Ferroalloys do | 17 | 27 | 34 |
| Crude steel (excluding castings) do | 585 | 1,157 | 1,935 |
| Lead: | | | |
| Mine output, metal content | [r] 11,722 | 11,827 | 10,047 |
| Metal, smelter | [r] 3,807 | 4,375 | 4,428 |
| Manganese ore and concentrate, gross weight | 1,999 | 1,721 | 2,107 |
| Molybdenum, mine output, metal content | [r] 127 | 118 | 146 |
| Nickel, mine output, metal content | -- | 11 | [e] 11 |
| Rare-earth metals, monazite concentrate, gross weight | 8 | 9 | [e] 10 |
| Silver, metal thousand troy ounces | [r] 1,663 | 1,490 | 1,307 |
| Tin, mine output, metal content long tons | ([2]) | 8 | 10 |
| Titanium, ore and concentrate (ilmenite), gross weight | NA | 165 | 160 |
| Tungsten, mine output, metal content | [r] 1,800 | 2,043 | 2,793 |
| Zinc: | | | |
| Mine output, metal content | [r] 37,318 | 48,319 | 42,266 |
| Metal, primary | 10,502 | 12,590 | 11,548 |
| Zirconium, concentrates, gross weight | 13 | 23 | 40 |
| NONMETALS | | | |
| Asbestos | 5,279 | 5,707 | 5,710 |
| Barite | 30 | 204 | 745 |
| Cement, hydraulic thousand tons | 6,486 | 8,175 | 8,842 |
| Clays, kaolin | [r] 108,205 | 208,537 | 271,812 |
| Diatomaceous earth | 1,955 | 3,982 | 11,688 |
| Feldspar | 14,689 | 28,460 | 24,617 |
| Fertilizer materials manufactured: | | | |
| Nitrogenous (urea) thousand tons | 691 | 698 | 812 |
| Phosphatic (magnesium phosphate) do | 160 | 157 | 173 |
| Mixed do | 493 | 630 | 652 |
| Fluorspar, metallurgical grade | [r] 27,997 | 22,156 | 16,261 |
| Graphite: | | | |
| Crystalline | 202 | 892 | 1,660 |
| Amorphous | 40,566 | 42,712 | 103,201 |
| Gypsum | -- | [e] 150,000 | 320,491 |
| Kyanite and related materials, andalusite | 32 | 83 | 115 |
| Lime, slaked [e] | 87,000 | 87,000 | 87,000 |
| Mica, sericite | 1,845 | 6,322 | 2,700 |
| Pyrite: | | | |
| Gross weight | 1,171 | 1,261 | 1,635 |
| Sulfur content | 410 | 378 | 491 |
| Salt, marine thousand tons | 452 | 742 | 574 |
| Sodium compounds: | | | |
| Sodium carbonate, manufactured | 72,573 | 84,402 | 97,028 |
| Stone, sand and gravel: | | | |
| Crushed and broken limestone thousand tons | 10,146 | 12,903 | 14,572 |
| Quartzite do | 153 | 238 | 325 |
| Sand (including glass sand) do | 148 | 172 | 261 |
| Talc and related materials: | | | |
| Pyrophyllite | [r] 122,399 | 224,040 | 208,701 |
| Talc | [r] 69,929 | 95,313 | 87,638 |

See footnotes at end of table.

Table 1.—Republic of Korea: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Carbon black | | 9,131 | 13,311 | 16,539 |
| Coal, anthracite | thousand tons | 12,403 | 13,571 | 15,290 |
| Coke | | -- | 322,976 | 600,000 |
| Fuel briquets, anthracite briquets | thousand tons | 10,515 | [e] 11,000 | [e] 11,000 |
| Peat | do | 4 | 4 | [e] 4 |
| Petroleum refinery products: | | | | |
| Gasoline | thousand 42-gallon barrels | 5,873 | 6,529 | 4,418 |
| Jet fuel | do | 4,212 | 3,661 | 4,039 |
| Kerosine | do | 2,673 | 3,007 | 2,492 |
| Distillate fuel oil | do | 14,679 | 17,952 | 18,401 |
| Residual fuel oil | do | 48,359 | 56,698 | 57,769 |
| Other | do | 10,093 | 10,900 | 17,062 |
| Refinery fuel and losses | do | 6,692 | 8,573 | NA |
| Total | do | 92,581 | 107,320 | NA |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] Officially reported production only.
[2] Less than ½ unit.

## TRADE

The Republic of Korea in 1974 was a net importer with regard to trade in minerals, fuels, and related commodities. Exports, exclusive of iron and steel products, totaled about 2.5 million tons valued at $182 million, whereas imports, on the same basis, totaled 21 million tons valued at $1.5 billion.

Overseas shipments of metalliferous ores and concentrates totaled 145,351 tons valued at $31.2 million compared with 349,151 tons valued at $23.8 million in 1973. The sharp decline in tonnage was accounted for by reduced shipments of iron ore and concentrates. Exports of tungsten ore and concentrates accounted for only 2% of the quantity but 52% of the value. Exports of ores and concentrates of zinc accounted for 37% of the quantity and 25% of the value, and exports of lead ore and concentrates accounted for 5% of the quantity and 9% of the value. Each of these metallic commodities recorded export declines in quantity and rises in value compared with those of 1973.

Exports of nonmetallic minerals totaled about 1.2 million tons valued at $30.2 million compared with 1.1 million tons valued at $17.3 million in 1973. Dimension stone exports rose to 117,417 tons valued at $10.3 million, most of which was granite and sandstone. Crushed stone, sand, and gravel shipments totaled 268,541 tons valued at $5.9 million. Nearly 85% of this value was accounted for by quartz and quartzite. Exports of clay totaled 191,436 tons valued at $5.3 million, and exports of graphite totaled 69,959 tons valued at $2.5 million. Most of the clay was kaolin, and most of the graphite was amorphous graphite containing not less that 75% fixed carbon. Talc exports consisted of 47,567 tons of powders valued at $3.4 million and unground talc and steatite totaling 2,124 tons, valued at $433,694. Agalmatolite shipments totaled 198,062 tons valued at $1.5 million.

Exports of processed mineral products were generally higher in 1974. Petroleum and petroleum products shipments reached 974,110 tons valued at $101 million. The tonnage increase was minor contrasted to the more than triple increase in value. Exports of cement totaled 978,045 tons valued at $28.2 million, while that of cement clinker totaled 971,683 tons valued at $20.7 million. Exports of manufactured fertilizers were not reported in official statistics. Mineral exports in 1973, the latest year for which detailed information is available, are shown in table 2.

Imports of crude and semiprocessed minerals continued to rise. Metalliferous ores and scrap metal, imported to feed the burgeoning metal refineries sector of the mining industry, doubled in tonnage and value to 2.7 million tons and $256 million. Iron ore, concentrates, and ferrous scrap imports to feed new iron and steel mills totaled 2.5 million tons valued at $195 million. Imports of nonferrous ores and concentrates totaled 111,376 tons valued at $16.6 million along with 38,482 tons valued at $44.1 million of nonferrous scrap metal. Principal items were copper ore, concentrates, and scrap and manganese ore and concentrate. Most of these imports were destined for nonferrous smelters.

Imports of petroleum and petroleum products were valued at $1.0 billion, a level nearly threefold higher than that in 1973. Nearly all of the imports were crude petroleum. Principal nonmetallic mineral imports were asbestos, 64,847 tons valued at $14.6 million, chemical-grade salt, 260,947 tons valued at $7.4 million, and sulfur, 213,446 tons valued at $11.9 million. Imports of portland cement totaled 57,700 tons valued at $1.6 million. Mineral imports in 1973, the latest year for which detailed information is available, are shown in table 3.

**Table 2.—Republic of Korea: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite and concentrate | | 5 | 700 |
| Metal, including alloys, all forms | | 7,296 | 4,810 |
| Bismuth: | | | |
| Ore and concentrate | | 9 | -- |
| Metal, including alloys | | -- | 2,082 |
| Chromium: | | | |
| Ore and concentrate | | 207 | -- |
| Oxides and hydroxides | | -- | 1 |
| Cobalt metal, including alloys, all forms | | 71 | 5 |
| Copper: | | | |
| Ore and concentrate | | (1) | (1) |
| Metal, including alloys, all forms | | r 652 | 484 |
| Iron and steel: | | | |
| Ore and concentrate | thousand tons | 475 | 261 |
| Scrap | do | 2 | 2 |
| Pig iron, ferroalloys and similar materials | do | 15 | 14 |
| Steel, primary forms | do | 5 | 44 |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | do | 118 | 54 |
| Universals, plates, sheets | do | 839 | 674 |
| Hoop and strip | do | (1) | 1 |
| Rails and accessories | do | (1) | 1 |
| Wire | do | 22 | 7 |
| Tubes, pipes, fittings | do | 50 | 100 |
| Castings and forgings | do | 1 | 22 |
| Total | do | 1,030 | 859 |
| Lead: | | | |
| Ore and concentrate | | 16,650 | 15,979 |
| Oxides | | -- | (1) |
| Metal, including waste and sweepings | | 504 | 205 |
| Manganese oxides | | 145 | -- |
| Molybdenum: | | | |
| Ore and concentrate | | 112 | 45 |
| Trioxide | | 10 | -- |
| Metal | | 6 | 1 |
| Nickel metal | | 10 | 1 |
| Platinum-group metals and silver: | | | |
| Ores and concentrates | | 2,989 | 3,760 |
| Metal, including alloys | thousand troy ounces | 376 | 176 |
| Selenium | | 1 | 5 |
| Tin: | | | |
| Ore and concentrate | long tons | 197 | 5 |
| Metal, including alloys, all forms | do | 13 | 23 |
| Titanium: | | | |
| Ore and concentrate | | (1) | -- |
| Oxides | | (1) | 190 |
| Tungsten: | | | |
| Ore and concentrate | | 4,035 | 4,368 |
| Metal, including waste and scrap | | (1) | 1 |
| Uranium and thorium metals, including alloys, all forms | kilograms | -- | 5 |
| Vanadium ore and concentrate | | 5 | -- |

See footnotes at end of table.

## Table 2.—Republic of Korea: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS—Continued | | |
| Zinc: | | |
| Ore and concentrate | 46,180 | 59,260 |
| Oxide | (1) | 210 |
| Metal, including alloys, all forms | 52 | 1 |
| Other: | | |
| Ores and concentrates of nonferrous metals, n.e.s | 206 | 805 |
| Ash and residue containing nonferrous metals | 754 | 89 |
| Oxides, hydroxides, peroxides of metals, n.e.s | (1) | -- |
| Base metals, including alloys, all forms, n.e.s | (1) | 107 |
| NONMETALS | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum | 488 | 1,068 |
| Dust and powder of precious and semiprecious stones, kilograms | -- | 5 |
| Grinding and polishing wheels and stones | 1 | 87 |
| Asbestos | 56 | 16,623 |
| Barite | -- | 346 |
| Cement and cement clinker, thousand tons | 1,177 | 1,531 |
| Chalk, kilograms | 2 | -- |
| Clays and clay products: | | |
| Crude clays, n.e.s.: | | |
| Kaolin | 77,693 | 212,258 |
| Other | 13,596 | 34,911 |
| Products: | | |
| Refractory | 44 | 765 |
| Nonrefractory | 17,494 | 48,359 |
| Diamond: | | |
| Gem, not set or strung, thousand carats | -- | 50 |
| Industrial, do | 170 | 17,190 |
| Diatomaceous earth | 96 | 129 |
| Feldspar, fluorspar, related materials: | | |
| Feldspar | 5,200 | 7,830 |
| Fluorspar | 27,626 | 24,239 |
| Other | 85,541 | 25,796 |
| Fertilizer materials: | | |
| Crude | (1) | -- |
| Manufactured: | | |
| Nitrogenous | 78,565 | 28,050 |
| Other, including mixed | 94,307 | 24,625 |
| Ammonia | (1) | -- |
| Graphite, natural | 28,402 | 44,935 |
| Gypsum and plasters | 26,128 | 363,751 |
| Lime | 150 | 13 |
| Mica, all forms | 772 | 3,228 |
| Pigments, mineral, processed iron oxides | (1) | 578 |
| Precious and semiprecious stones, except diamond, including synthetic, kilograms | 1,038,384 | 1,218 |
| Salt | 1,103 | 241 |
| Sodium and potassium compounds, n.e.s | 2,200 | 422 |
| Stone, sand and gravel: | | |
| Dimension stone | 22,301 | 80,731 |
| Dolomite, chiefly refractory grade | 17,950 | 19,400 |
| Gravel and crushed stone | 18,956 | 9,284 |
| Limestone | (1) | 13 |
| Quartz and quartzite | 90,814 | 137,503 |
| Sand, excluding metal bearing | r 14,595 | 10,513 |
| Sulfur: | | |
| Elemental | 450 | -- |
| Sulfur dioxide, kilograms | -- | 486 |
| Sulfuric acid, do | 15 | 337 |
| Talc, crude and ground (including natural steatite) | 37,119 | 65,015 |
| Other nonmetals, n.e.s.: | | |
| Crude: | | |
| Meershaum, amber, jet | 330 | 50 |
| Other | 36,232 | 141,722 |
| Slag, dross and similar waste, not metal bearing | 40,180 | 33,043 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 159 | 4,165 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Asphalt and bitumen, natural | 40 | -- |
| Carbon black and gas carbon | 6 | -- |
| Coal, coke, peat | 159,053 | 219,150 |
| Petroleum: | | |
| Crude, thousand 42-gallon barrels | r 4 | 32 |

See footnotes at end of table.

## Table 2.—Republic of Korea: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum—Continued | | | |
| Refinery products: | | | |
| Gasoline | thousand 42-gallon barrels | r 449 | 1,799 |
| Kerosine | do | r 356 | 456 |
| Distillate fuel oil | do | r 2,749 | 1,151 |
| Residual fuel oil | do | r 389 | 2,084 |
| Lubricants | do | r 2 | 2 |
| Other | do | r 4,148 | 2,557 |
| Total | do | r 8,093 | 8,049 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | 5,533 | 19,305 |

r Revised.
[1] Less than ½ unit.

## Table 3.—Republic of Korea: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | | 50 | 300 |
| Oxide and hydroxide: | | | |
| For use in manufacturing aluminum | | 28,575 | 28,895 |
| Other | | r 10,155 | 10,795 |
| Metal including alloys, all forms | | | 26,514 |
| Arsenic: | | | |
| Trioxide, pentoxide, acid | | 134 | 273 |
| Metal, including alloys | kilograms | 3 | 60 |
| Beryllium metal including alloys, all forms | do | 125 | 18 |
| Chromium oxide and hydroxide | | 419 | 714 |
| Cobalt: | | | |
| Ore and concentrate | kilograms | r 778 | 1,070 |
| Oxide and hydroxide | | 4 | 18 |
| Copper: | | | |
| Ore and concentrate | | 16,188 | 20,866 |
| Matte | | (1) | 85 |
| Metal including alloys, all forms | | r 23,496 | 29,405 |
| Iron and steel: | | | |
| Ore | thousand tons | 20 | 468 |
| Metal: | | | |
| Scrap | do | 520 | 808 |
| Pig iron, ferroalloys, similar materials | do | 83 | 88 |
| Steel, primary forms | do | 950 | 1,377 |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | do | 731 | 128 |
| Universals, plates, sheets | do | 94 | 294 |
| Hoop and strip | do | 40 | 37 |
| Rails and accessories | do | 6 | 38 |
| Wire | do | 6 | 4 |
| Tubes, pipes, fittings | do | 36 | 57 |
| Castings and forgings, rough | do | (1) | 1 |
| Total | do | r 913 | 559 |
| Lead: | | | |
| Ore and concentrate | | 3,960 | 1,410 |
| Oxides | | 2 | 6 |
| Metal including alloys, all forms | | r 4,258 | 13,013 |
| Magnesium: | | | |
| Ore and concentrate | | 4,620 | -- |
| Metal including alloys, all forms | | 32 | 119 |
| Manganese: | | | |
| Ore and concentrate | | 11,644 | 30,345 |
| Oxide and hydroxide | | 807 | 745 |
| Mercury | 76-pound flasks | 312 | 839 |
| Molybdenum: | | | |
| Trioxide | kilograms | 4 | -- |
| Metal including alloys, all forms | | 9 | 6 |
| Nickel: | | | |
| Matte, speiss, similar materials | | -- | 40 |
| Oxide and hydroxide | kilograms | 454 | 356 |
| Metal including alloys, all forms | | 173 | 1,137 |
| Phosphorus, elemental | | 44 | 33 |
| Platinum-group metals and alloys | troy ounces | 65,651 | 2,170 |
| Rare-earth metals, including alloys | | 1 | 6 |
| Selenium, elemental | kilograms | 2,011 | 1,260 |

See footnotes at end of table.

## Table 3.—Republic of Korea: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS—Continued | | |
| Silicon, elemental | 56 | 139 |
| Silver thousand troy ounces | 232 | 207 |
| Tantalum metal, all forms value | r $178 | $4,081 |
| Tin: | | |
| Ore and concentrate long tons | (1) | 4,887 |
| Oxides do | 1 | (1) |
| Metal including alloys, all forms do | 544 | 1,590 |
| Titanium: | | |
| Ore and concentrate: | | |
| Rutile | 680 | 1,029 |
| Ilmenite | 4,722 | 13,956 |
| Oxides | 1,695 | 578 |
| Tungsten metal including alloys, all forms | 12 | 19 |
| Uranium and thorium metals including alloys, all forms kilograms | 501 | 1 |
| Vanadium pentoxide do | 68 | 253 |
| Zinc: | | |
| Ore and concentrate | 880 | 3,140 |
| Oxide | 212 | 291 |
| Metal including alloys, all forms | 7,639 | 22,145 |
| Zirconium ore and concentrate | r 400 | 652 |
| Other: | | |
| Ore and concentrate of base metals, n.e.s | 238 | 59 |
| Ash and residue containing nonferrous metal | 5,206 | 5,576 |
| Metals including alloys: | | |
| Metalloids | (1) | 3 |
| Pyrophoric alloys | (1) | 2 |
| Base metals, including alloys, all forms, n.e.s | 211 | 39 |
| NONMETALS | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | 477 | 891 |
| Dust and powder of precious and semiprecious stones, including diamond kilograms | 1,322 | 270 |
| Grinding and polishing wheels and stones | 148 | 172 |
| Asbestos | 59,533 | 96,229 |
| Barite | 915 | 91 |
| Boron materials: | | |
| Crude natural borates kilograms | 174 | 300 |
| Oxide and acid | 449 | 483 |
| Bromine | 2 | (1) |
| Cement, hydraulic | 1,635 | 411 |
| Chalk | 2 | 8 |
| Clays and clay products (including all refractory brick): | | |
| Crude clays, n.e.s | 9,853 | 18,894 |
| Products: | | |
| Refractory (including nonclay bricks) | 35,258 | 28,198 |
| Nonrefractory | 244 | 109 |
| Cryolite kilograms | 3 | -- |
| Diamond, industrial value | $66,014 | $142,775 |
| Diatomite and other infusorial earth | 99 | 288 |
| Feldspar and fluorspar | 1,009 | -- |
| Fertilizer materials: | | |
| Crude: | | |
| Phosphatic | 528,934 | 530,587 |
| Other | 40 | -- |
| Manufactured: | | |
| Nitrogenous | 7,560 | 9,552 |
| Phosphatic | 3,000 | 48,843 |
| Potassic | 163,942 | 179,983 |
| Other, including mixed | 40,533 | 18,425 |
| Ammonia | 7,027 | 31,090 |
| Fluorine, elemental kilograms | -- | 19 |
| Graphite, natural | (1) | 15 |
| Gypsum and plasters | 514 | 577 |
| Iodine | 4 | 8 |
| Lime | 1,581 | 22 |
| Magnesite, crude, calcined, and magnesia clinker | 37 | 80 |
| Mica, all forms | 87 | 131 |
| Pigments, mineral, including processed iron oxides | 529 | 187 |
| Precious and semiprecious stones, except diamond, including synthetic value, thousands | $218 | $439 |
| Pyrite, unroasted | -- | 4,124 |
| Salt | 275,600 | 267,912 |
| Sodium and potassium compounds, n.e.s | 7,661 | 17,019 |
| Stone, sand and gravel: | | |
| Dimension stone, crude and partly worked | 53 | 31 |
| Dolomite, chiefly refractory grade | 224 | 103 |

See footnotes at end of table.

Table 3.—Republic of Korea: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| NONMETALS—Continued | | |
| Stone, sand and gravel—Continued | | |
| Gravel and crushed rock | (1) | 18 |
| Limestone | (1) | 105,032 |
| Quartz and quartzite | 43 | 173 |
| Sand, excluding metal bearing | 54 | 877 |
| Sulfur: | | |
| Elemental | 136,213 | 167,968 |
| Sulfur dioxide | 3 | 3 |
| Sulfuric acid | 292 | 85 |
| Talc, steatite, soapstone, pyrophyllite | 7 | 18 |
| Other nonmetals, n.e.s.: | | |
| Crude | r 256 | 844 |
| Slag, dross and similar waste, not metal bearing | r 6 | 901 |
| Oxides, hydroxides, and peroxides of magnesium, strontium, and barium | 59 | 384 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 428 | 1,135 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Asphalt and bitumen, natural | 4 | 13 |
| Carbon black and gas carbon | 1,549 | 2,387 |
| Coal, all grades, including briquets | 8,845 | 611,713 |
| Coke and semicoke | 22,101 | 37,468 |
| Gases, rare | 73 | 127 |
| Helium | 5 | 27 |
| Petroleum: | | |
| Crude and partly refined ---------- thousand 42-gallon barrels | r 92,581 | 113,269 |
| Refinery products: | | |
| Gasoline ---------- do | r 26 | 18 |
| Kerosine ---------- do | (2) | 1,907 |
| Distillate fuel oil ---------- do | r 23 | -- |
| Residual fuel oil ---------- do | (2) | 551 |
| Lubricants ---------- do | r 1,157 | 461 |
| Other ---------- do | r 239 | 522 |
| Total ---------- do | r 1,445 | 3,459 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 18,482 | 23,560 |

r Revised.
1 Less than ½ unit.
2 Revised to none.

## COMMODITY REVIEW

### METALS

**Copper.**—Construction of the 100,000-ton-per-year copper refinery at Onsan was delayed when a major partner deferred participation because of rising construction costs.

**Iron and Steel.**—New contracts were signed for the construction of a sintering plant, a lime calcining plant, and a complete cold-rolling mill at the Pohang iron and steel plant. Other steel projects under consideration include the Second Steel Corp. steel mill with a 7-million-ton-per-year capacity; the Korea Heavy Machine Industries Ltd., alloy steel plant; and the Inchon Iron and Steel Co., Ltd., direct reduction iron plant.

**Tungsten.**—Production of ammonium paratungstate totaled 900 tons in 1974, but domestic consumption was still negligible. Korean Tungsten Mining Co., Ltd., which also operated the Sangdong tungsten mine, was the producer. Tungsten carbide and tungsten powder were also produced in 1974, but consumption was negligible.

### NONMETALS

**Cement.**—The Korean cement industry is expected to increase its production capacity from about 9 million tons per year to 20 million tons per year by about 1980.[3] The industry is dominated by Ssangyong Cement Manufacturing Co., Ltd., which accounts for about 45% of capacity and production and 90% of the large export trade. The company plans to more than double capacity by 1977. Hanil Cement Manufacturing Co. plans to raise capacity at its Seoul plant by 1 million tons per year.

[3] Cho, Hai-Hyung. Korean Cement Industry Expands to Meet Domestic and Export Demand. Rock Products, v. 77, No. 5, May 1974, pp. 80–81, 125–126.

## MINERAL FUELS

**Petroleum.**—The nation's three major refineries operated at less than capacity in 1974, which was attributed to declining demand resulting from price increases for foreign crude petroleum and unstable international petroleum conditions. The Government's new energy plan envisions four new refineries, improving the Kyon In refinery, and constructing storage facilities. Since the Republic of Korea depends on foreign sources for its crude oil, the plan also called for improved supply arrangements and a broader supply base.

A billion-dollar expansion of the petrochemical industry is being planned, with a new petrochemical complex at Yosu, the heart of the expansion. The complex would triple the capacity of the Republic of Korea's chemical industry that is based on petroleum. Again, the unsettled petroleum supply situation caused planning and implementation to be delayed.

**Uranium.**—The National Geological and Mining Institute processed uranium ore for fuel use. Korea reportedly has known uranium reserves of 6 million tons. Westinghouse Electric Corp., Pittsburgh, Pa., was reportedly awarded a contract for the construction of a 600-megawatt nuclear powerplant near Pusan for Korea Electric Co. The plant was to be operational by 1979.

# The Mineral Industry of Kuwait and Saudi Arabia

By John L. Albright [1]

## CONTENTS



The former Kuwait-Saudi Arabia Neutral Zone has been partitioned into two equal administrative areas since December 1969; the northern half has been administered by Kuwait, and the southern half, by Saudi Arabia. Petroleum has been the only marketable mineral obtained both onshore and offshore in the partitioned zone, and the two countries have shared the revenue from the production of crude oil. In 1974, three oil companies worked concessions in the former Neutral Zone: Arabian Oil Co., Ltd. (AOC), American Independent Oil Co. (Aminoil), and Getty Oil Co. AOC was the concessionaire for both Kuwait and Saudi Arabia offshore operations, Aminoil was the onshore concessionaire for Kuwait, and Getty was the onshore concessionaire for Saudi Arabia. AOC and Aminoil activities will be discussed under Kuwait, and Getty activities will be discussed under Saudi Arabia, although many Getty facilities were located in the Kuwait-administered area.

## KUWAIT

Oil production and shipments fell during 1974, but Kuwait strengthened its hold on the country's petroleum industry by becoming the dominant owner of the Kuwait Oil Co., Ltd. (KOC), one of the largest oil producers in the Middle East. The Government formed the Kuwait Oil, Gas, and Energy Corp. (KOGEC) to take charge of the country's energy interests. KOGEC was capitalized at $507 million,[2] and the Government owned all but 240 of the 3 million shares in the firm. The balance was distributed equally among Kuwaiti companies.[3] KOGEC's responsibilities included marketing the State's share of participation crude oil.

A Supreme Petroleum Council was established within the Kuwaiti Council of Ministers and charged with formulating policies that would lead to the development of a fully integrated national oil industry and associated, oil-based industries. Members of the new Council included the President of the Council of Ministers and the Ministers of Finance and Oil, Foreign Affairs, Trade and Industry, and State for Council of Ministers Affairs.[4]

Egypt and Kuwait issued a joint communiqué in December that discussed joint projects valued at more than $1.3 billion, which included constructing a jointly owned, export-oriented cement plant in Egypt, rated at 1 milllion tons per year;

[1] Mineral specialist (petroleum), Division of Petroleum and Natural Gas.

[2] Where necessary, values have been converted from Kuwaiti dinars (KD) to U.S. dollars at the rate of KD1=US$3.43.

[3] Middle East Economic Survey (Beirut, Lebanon). New State Entity to Take Charge of Government's Oil and Gas Interests. V. 17, No. 43, Aug. 16, 1974, pp. 1–2.

[4] Middle East Economic Survey (Beirut, Lebanon). Kuwait Established Supreme Petroleum Council. V. 17, No. 46, Sept. 6, 1974, pp. 7–8.

Kuwaiti financing of up to $150 million for the Abu Tartur phosphates project; and the establishment of a jointly owned maritime transport company. Kuwait and Libya signed an agreement with Yugoslavia whereby the two Arab States would financially assist Yugoslavia in construction of a petroleum refinery at Koper, on the Adriatic coast.

## PRODUCTION

In 1974, Kuwait was the world's sixth largest crude oil producer and the third largest in the Middle East. Crude oil output totaled 894.8 million barrels during the year, of which nearly 90% was produced in Kuwait by KOC, and the remainder was produced by Aminoil and AOC in the former Kuwait-Saudi Arabia Neutral Zone. Crude oil output by the KOC, which averaged 2.6 million barrels per day in January, fell to 2.0 million barrels per day during the month of July and averaged 2.3 million barrels per day for the year, off 17.5% from the company's 1973 oil output. Kuwait's share of oil production from the Neutral Zone oilfields increased 3.8% from that of 1973 and averaged 271,500 barrels per day during 1974.

Large quantities of natural gas were produced in association with the crude oil production operations, but gross gas production declined 22.2% to 452.8 billion cubic feet in 1974. KOC produced 92% of the total, and the remainder came from fields in the Neutral Zone. Utilization of gas during the year was 57.9% of the total production, an improvement of 9.4% from 1973.

Table 1.—Kuwait: Production of mineral commodities

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| NONMETALS | | | | |
| Clay products, nonrefractory, sand-lime bricks | cubic meters | 230,451 | 148,383 | NA |
| Fertilizer materials, manufactured, nitrogenous: | | | | |
| Ammonium sulfate | metric tons | 92,179 | 118,795 | NA |
| Urea | do | 514,249 | 580,075 | NA |
| Lime, hydrated and quicklime | do | 1,811 | 401 | e 400 |
| Salt | do | 4,977 | 10,030 | e 10,000 |
| Sulfur | do | 51,884 | 65,070 | 56,899 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Natural gas: | | | | |
| Gross production [1] | million cubic feet | 647,808 | 581,965 | 452,760 |
| Marketed production [1] | do | r 181,645 | 186,045 | 187,579 |
| Natural gas liquids: | | | | |
| Natural gasoline | thousand 42-gallon barrels | 5,580 | r e 5,900 | NA |
| Liquefied petroleum gas (propane and butane) | do | 15,005 | r e 16,300 | NA |
| Total | do | 20,585 | 22,200 | e 17,800 |
| Petroleum: | | | | |
| Crude [1] | do | r 1,201,596 | 1,102,465 | 894,781 |
| Refinery products: [2] | | | | |
| Motor gasoline | do | 14,373 | 14,922 | 25,157 |
| Jet fuel | do | 874 | 855 | 1,406 |
| Kerosine | do | 6,158 | 7,787 | 8,540 |
| Distillate fuel oil | do | 25,079 | 27,196 | 24,145 |
| Residual fuel oil | do | 75,294 | 70,439 | 86,902 |
| Other: | | | | |
| Naphtha | do | 11,503 | 12,698 | 5,691 |
| Asphalt | do | 232 | 328 | 1,610 |
| Unspecified | do | 4,900 | 4,535 | -- |
| Refinery fuel and losses | do | 2,912 | 3,246 | 3,688 |
| Total | do | 141,325 | 142,006 | 157,139 |

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Includes Kuwait's one-half share of production in the former Kuwait-Saudi Arabia Neutral Zone.

[2] Includes Kuwait's share of refinery output by its concessionaires in the former Kuwait-Saudi Arabia Neutral Zone.

## TRADE

The country realized a favorable balance of trade during 1974; the estimated value of exports and reexports was $10.7 billion that of imports was $1.5 billion. Petroleum was the most important export commodity. Despite difficulties in marketing mainly because of price disagreements with potential purchasers, crude oil shipments to foreign markets totaled 828.7 million barrels in 1974, down 21.4% from the 1,054.0 million barrels exported during 1973. Western Europe continued to be Kuwait's largest oil market, but Japan imported more Kuwaiti crude oil than any other country. Exports of refined petroleum products increased in 1974 totaling 140.1 million barrels during the year including bunkers, compared with 101.4 million barrels in 1973.

Kuwait held several unsuccessful auctions of government crude oil in 1974. During the first quarter, the Government offered 85 million barrels of oil to international bidders, but Kuwait refused all offers. Some companies rebid, and the Government was able to complete some sales. In June, Kuwait announced that it would auction its share of KOC-produced crude oil for the remainder of 1974, 1.25 million barrels per day. Bidding in the June oil auction was apparently below the minimum level of 93% of the posted price expected by the Government, and Kuwait reportedly rejected all bids.

Kuwait and Lebanon negotiated an economic cooperation agreement during 1974 that should stimulate trade between them, and discussions were held with Bangladesh that may lead to expanded trade and joint mineral-industry projects. Iraq and Kuwait reached an agreement whereby Iraq may use Kuwait's ports for unloading goods destined for Iraq. Preliminary talks were also held concerning the construction of a railroad from Umm Qasr port to Iraq.

Table 2.—Kuwait: Exports of mineral commodities [1]
(Metric tons unless otherwise specified)

| Commodity | 1973 | 1974 |
|---|---|---|
| METALS | | |
| Aluminum metal including alloys, unwrought and semimanufactures | 36 | 40 |
| Copper metal including alloys, unwrought and semimanufactures | 7 | 48 |
| Iron and steel metal: | | |
| Scrap | 51,680 | 72,072 |
| Pig iron, ferroalloys, and similar materials | -- | 1 |
| Semimanufactures | 36,041 | 43,405 |
| Lead metal including alloys, unwrought and semimanufactures | 5 | 19 |
| Tin metal including alloys, unwrought and semimanufactures long tons | (2) | 4 |
| Zinc, blue powder | 32 | 154 |
| Other: | | |
| Nonferrous metal scrap | 5,721 | 6,438 |
| Metal including alloys, all forms | (2) | (2) |
| NONMETALS | | |
| Abrasives, natural, n.e.s., grinding and polishing wheels and stones | 6 | 10 |
| Cement | 20,360 | 1,146 |
| Clays and clay products (including all refractory brick): | | |
| Crude clays, bentonite | 15,929 | 32,520 |
| Products: | | |
| Refractory (including nonclay bricks) | 2 | 24 |
| Nonrefractory | 630 | -- |
| Diamond carats | -- | 500 |
| Fertilizer materials: | | |
| Crude | -- | 60 |
| Manufactured: | | |
| Nitrogenous | 692,407 | 670,668 |
| Other, including mixed | 32 | 120 |
| Ammonia | 77,822 | 144,240 |
| Gypsum and plasters | 3 | 40 |
| Lime | 11 | -- |
| Pigments, mineral, including processed iron oxides | 145 | -- |
| Salt (excluding brine) | 362 | 733 |
| Sodium and potassium compounds, n.e.s., caustic soda | 2,398 | 4,055 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude and partly worked | 56 | 267 |
| Worked | 276 | 291 |
| Gravel and crushed rock | 77 | 1,174 |
| Limestone (except dimension) | (2) | -- |
| Sand | 25,783 | 7,715 |

See footnotes at end of table.

## Table 2.—Kuwait: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1973 | 1974 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Sulfur: | | | |
| Elemental, all forms | | 39,252 | 16,484 |
| Sulfuric acid | | 4,732 | 5,514 |
| Other nonmetals, n.e.s.: | | | |
| Crude | | 2 | 86 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | | 6,278 | 6,596 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal and coke, including briquets | | 10 | -- |
| Petroleum: | | | |
| Crude | thousand 42-gallon barrels | r 1,053,980 | 828,716 |
| Refinery products: | | | |
| Shipments other than bunkers: | | | |
| Gasoline | do | 14,661 | 20,543 |
| Kerosine and jet fuel | do | 3,053 | 8,556 |
| Distillate fuel oil | do | 15,033 | 19,556 |
| Residual fuel oil | do | r 31,258 | 44,339 |
| Other: | | | |
| Liquefied petroleum gas | do | r 1,573 | [3] 22,073 |
| Unspecified | do | | |
| Total | do | r 65,578 | [3] 115,067 |
| Bunkers: | | | |
| Distillate fuel oil | do | r 1,083 | 488 |
| Residual fuel oil | do | 34,783 | 24,572 |
| Total | do | r 35,866 | 25,060 |

r Revised.
[1] Includes Kuwait's share of former Neutral Zone exports of petroleum.
[2] Less than ½ unit.
[3] Data includes natural gas plant liquids.

## Table 3.—Kuwait: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1973 | 1974 |
|---|---|---|
| METALS | | |
| Aluminum metal including alloys, unwrought and semimanufactures | 2,383 | 891 |
| Copper metal including alloys, unwrought and semimanufactures | 324 | 3,007 |
| Iron and steel metal: | | |
| Scrap | 8,477 | 9,942 |
| Pig iron, ferroalloys, and similar materials | 2 | 137 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections | 81,323 | 189,710 |
| Universals, plates, sheets | 73,749 | 75,674 |
| Wire | 1,738 | 3,251 |
| Tubes, pipes, fittings | 26,308 | 36,942 |
| Lead metal including alloys, unwrought and semimanufactures | 131 | 1,012 |
| Nickel metal including alloys, unwrought and semimanufactures | -- | -- |
| Silver and platinum troy ounces | -- | 686 |
| Tin metal including alloys, unwrought and semimanufactures long tons | 14 | 4 |
| Uranium, radium, thorium, and alloys value | $18,900 | $66,227 |
| Other: | | |
| Nonferrous metal scrap, not subdivided | 1,025 | 980 |
| Metal including alloys, unwrought and semimanufactures | 19 | 28 |
| NONMETALS | | |
| Abrasives, natural, n.e.s., grinding and polishing wheels and stones | 145 | 117 |
| Asbestos | 3,640 | 5,405 |
| Bentonite | 13,425 | 50,176 |
| Cement | 628,164 | 871,000 |
| Clay products: | | |
| Refractory (including nonclay bricks) | 1,201 | 1,314 |
| Nonrefractory | 915 | 21 |
| Diamond, gem, not set or strung carats | 1,845 | 28,600 |
| Fertilizer materials: | | |
| Crude, natural, all types | 2 | 29 |
| Manufactured including mixed | 181 | 122 |
| Graphite | 29 | 1,148 |
| Gypsum and plasters | 15,167 | 16,304 |

See footnotes at end of table.

Table 3.—Kuwait: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1973 | 1974 |
|---|---|---|
| NONMETALS—Continued | | |
| Lime | 785 | 729 |
| Precious and semiprecious stones, except diamond ---- carats | 274,190 | 669,975 |
| Salt | 5,322 | 6,230 |
| Sulfur, sulfuric acid | 64 | 81 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Unworked: | | |
| Marble | 6,275 | 4,777 |
| Mosaic stones, pebbles, powder | 51,018 | 46,302 |
| Other | 2,339 | 3,353 |
| Worked | 9,480 | 11,123 |
| Gravel and crushed stone | 27,744 | 6,425 |
| Sand | 20 | 3,331 |
| Sodium and potassium compounds, caustic soda | 113 | 2 |
| Other: | | |
| Agricultural soil and clay | 55 | 44 |
| Unspecified crude minerals, chalk, colored soil clay | 196 | 582 |
| Materials of asphalt asbestos and fiber cement | 1,138 | 1,654 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Coal and coke, including briquets | 320 | 284 |
| Petroleum refinery products: | | |
| Gasoline ---- thousand 42-gallon barrels | 30 | 26 |
| Kerosine and jet fuel ---- do | 5 | 3 |
| Lubricants ---- do | 166 | 222 |
| Other asphalt ---- do | 264 | 278 |
| Total ---- do | 465 | 529 |

## COMMODITY REVIEW

**Metals.**—*Iron and Steel.*—Kuwait Metal Pipe Industries ordered two spiral-weld steel pipe plants from a West German firm. The plants will produce pipes for agricultural and petroleum usage.

Kuwaiti Governmental and private interests formed a large joint stock iron and steel company, capitalized at $50.7 million. The company will invest in mines and quarries, import and market raw materials utilized in the iron and steel industry, establish iron and steel production and processing plants, and market iron and steel products. Citizens of Bahrain and the United Arab Emirates may hold shares in the Kuwait company.[5]

**Nonmetals.**—*Fertilizer Materials.*—Kuwait and Syria agreed to establish a joint investment company to engage in numerous economic projects, including the production of superphosphates in Syria. In August, the Kuwaiti Council of Ministers approved the amalgamation of the Petrochemical Industries Co. and its wholly owned subsidiary, the Kuwait Chemical Fertilizers Co.

**Mineral Fuels.**—*Natural Gas.*—The Government launched an extensive project, called Kuwait Gas Utilization Project (KGUP). KGUP calls for processing large volumes of natural gas and recovering over 5 million tons per year of natural gas liquids (NGL); that is, butane, natural gasoline, and propane. Costs will probably exceed $300 million for the transmission, processing, and storage facilities required. The first part of the project has been scheduled to be commissioned in 1977.

*Petroleum.*—In January 1974, the Government of Kuwait concluded a participation agreement with BP (Kuwait) Ltd. and Gulf Kuwait Co. under which the Government acquired 60% of the KOC operations and facilities in Kuwait. The Government had failed to ratify a 1973 agreement that had called for the State's initial share of 25% in KOC. The 1974 agreement included KOC's oil exploration and production installations and their output, as well as company's petroleum refinery, gas liquefaction plant, and its oil shipping facilities. Under the agreement that was ratified by Parliament in May 1974, the Government acquired the controlling interest in KOC at a cost of $112 million, and BP and Gulf each retained 20% interest in the oil company.[6] The agreement was for 5 years from January 1974 and granted the Government the right to raise its participation 7% per year, reaching 95% by yearend 1979.[7] BP, Gulf, and government officials held lengthy negotia-

[5] Middle East Economic Survey (Beirut, Lebanon). Kuwait Participates in a New Iron and Steel Company. V. 17, No. 40, July 26, 1974, p. 8.
[6] World Oil. Kuwait. V. 179, No. 3, Aug. 15, 1974, pp. 148–149.
[7] Wall Street Journal. Kuwait to Buy 60% of Oil Firm There Owned by Gulf, BP. V. 183, No. 23, Feb. 1, 1974, p. 4.

tions concerning the buy-back price for the Government's share of oil, and in July, BP and Gulf accepted the Government's buy-back price of $10.95 per barrel of oil, or 94.85% of the posted price, for 350,000 barrels per day of crude oil, which was to be lifted during the third quarter of the year. The agreement was reached only after the Government threatened to leave the oil in the ground if it did not get its requested buy-back price. The Government also informed BP and Gulf that if they failed to purchase substantial quantities of the Government's oil during the third quarter of 1974, future liftings of the Government's share of KOC oil would be denied to them.[8] Effective October 1, Kuwait raised royalty and tax rates to 16.67% from 14.5% and to 65.75% from 55%, respectively, and reduced the buy-back price to $10.74 per barrel for fourth-quarter 1974 sales to BP and Gulf. At the same time, the Government increased BP's and Gulf's fourth-quarter liftings to 450,000 barrels per day each. The average cost per barrel to the companies for the last quarter of 1974 was $9.44, $8.27 on 500,000 barrels per day each of equity oil and $10.74 on 450,000 barrels per day each of buy-back oil. In December, the Government announced that it would charge BP and Gulf a single price of $10.147 per barrel for all oil lifted during the first quarter of 1975. The new prices were set in line with the November 1974 Organization of Petroleum Exporting Countries (OPEC) recommended pricing formula.[9] Buy-back prices for AOC's Neutral Zone crude oil were set at $10.66 per barrel for Khafji oil and $10.88 per barrel for Hout crude, retroactive to January 1.

In August, Japan's AOC agreed to Kuwait's demand for 60% participation in AOC's oil operations in Kuwait, retroactive to January.[10] The Government also reportedly sought 85% ownership in Aminoil, Kuwait's remaining oil producer. Aminoil did not export any crude oil in 1974 but processed it at the company's Mena Abdulla refinery and exported most of the output as fuel oil and naphtha.

Kuwait's oil revenues from income tax and royalties reached $8.3 billion during the financial year April 1974 to March 1975, more than four times as large as the $1.98 billion collected during the previous year.

An Italian engineering firm was engaged in expanding the Kuwait National Petroleum Co. (KNPC) Shuaiba petroleum refinery during 1974. The refining capacity was being enlarged to about 180,000 barrels per day from 140,000 barrels per day. KNPC also assumed the responsibility of marketing the Government's share of KOC-refined petroleum. KOC processed 47.5 million barrels of oil during 1974 (averaging 130,000 barrels per day), off 17.5 million barrels from 1973. The 1974 refinery operations included 4.2 million barrels of oil for the Government. KOC increased the capacity of its bitumen plant to 70,000 tons per year from 48,000 tons per year. The company produced 1.9 million long tons of gas liquids in 1974, nearly the same level as the 2.0 million long tons produced in 1973.

Kuwait expressed interest in establishing an asphalt refinery in the country, and an Indian firm offered to prepare a feasibility study on a lubricating oil plant for Kuwait. Along with Libya, Kuwait agreed to assist in financing the construction of a 160,000-barrel-per-day petroleum refinery in Yugoslavia. Most of the output from the $300 million plant will be marketed outside of Yugoslavia.[11]

Plans were finalized for the construction of 325 kilometers of natural gas and 214 kilometers of condensate pipelines to serve the country's natural gas utilization project. Kuwait financed the construction project for a 850-kilometer petroleum pipeline in Sudan and held discussions with Yugoslavia concerning Kuwaiti financing of a planned oil pipeline in that country.

AOC had two drilling rigs working in its offshore concession and reportedly had scheduled 25 wells to be drilled in 1974. In 1973, the company drilled 20 wells in the offshore Khafji oilfield. KOC carried out geological mapping in Raudhatain, Sabiriyah, and Umm Gudair oilfields. A Spanish firm began services during January against a 2-year contract for drilling and workover operations for the KOC and drilled an appraisal well in the Bahrah Field. KOC reported that 123 wells were

[8] Journal of Commerce. Gulf Defends Kuwait Deal. V. 321, No. 23,245, July 22, 1974, p. 9.
[9] Oil and Gas Journal. Kuwait to Kick Off Latest OPEC Price Boosts. V. 72, No. 52, Dec. 30, 1974, p. 77.
[10] Journal of Commerce. Arabian Oil, Kuwait Reach Terms. V. 321, No. 23,271, Aug. 27, 1974, p. 10.
[11] Petroleum Times. Libya and Kuwait Finance Koper Refinery. V. 73, No. 1993, Oct. 4, 1974, p. 21.

worked over during 1974, nearly double the number worked over in 1973. The company had 691 producing oil wells in 1974.

Kuwait Oil Tanker Co. (KOTC) completed its first year under Kuwaiti management; previously the company had been managed by a British firm. During the year, KOTC placed an order with a Japanese shipyard for a 261,000-deadweight-ton tanker for delivery in mid-1977 and ordered four 70,000-cubic-meter liquid gas carriers from a French shipbuilder. A 360,000-deadweight-ton tanker was under construction in a Spanish shipyard for KOTC, scheduled for delivery in mid-1975.

The Middle East Gas and Petrochemical Co., a privately owned liquefied petroleum gas (LPG) tanker company formed in Kuwait in 1974, reportedly ordered the construction of a number of ocean tankers from foreign shipyards. Four 70,000-cubic-meter LPG carriers were ordered from France at a total cost of $196 million, and several smaller LPG tankers were ordered from a Spanish firm.

## SAUDI ARABIA

Dissatisfied with its 1973 agreement with the Arabian American Oil Co. (Aramco) that provided for 51% government participation in the company's operations by 1982, the Saudi Arabian Government early in 1974 initiated talks for expanded government participation in Aramco's operations. Saudi Arabia had obtained a 25% share in the company's oil operations in 1973. In June 1974, the U.S. companies in Aramco reached an interim agreement with the Government giving Saudi Arabia a 60% share in Aramco's Saudi Arabian operations retroactive to January 1, 1974.[12] Under the new agreement, Exxon Corp., Standard Oil Co. of California, and Texaco Inc. will each hold 12% and Mobil Oil Corp. 4% of the giant oil company's operations in Saudi Arabia. Discussions were held during the second half of the year for Saudi Arabia's complete control of Aramco's oil operations, but the negotiations were not completed by the yearend. In 1974, Aramco remained the world's largest petroleum producing and exporting company.

Saudi Arabia's oil revenues increased by more than 430% in 1974 to $22.6 billion,[13] compared with $4.2 billion in 1973; Aramco was the largest contributor to the Government oil income (99% of the total), and most of the remainder was paid by the Arabian Oil Co. Ltd. (AOC) and Getty Oil Co.[14]

Two Saudi Arabian tanker companies were formed during 1974, and both included foreign interests. Saudi Maritime Co. was formed by Saudi Arabian and U.S. investors, including the Mobil Oil Corp., to engage in international shipments of petroleum and dry cargo. Mitsui OSK Lines Ltd. of Japan together with Saudi interests formed the Saudi Arabian Shipping Co. The Government announced that it would give preference to Saudi-owned tanker companies for exporting its petroleum.[15]

### PRODUCTION

Saudi Arabia was the largest oil producer in the Middle East and the third largest in the world in 1974, behind the U.S.S.R. and the United States. Aramco was Saudi Arabia's largest producer, accounting for about 97% of the total production. Aramco's crude oil output remained below the 8-million-barrel-per-day level during the first quarter of the year and reached a record rate of 8.8 million barrels per day during the month of October. The company's oil production averaged 8.2 million barrels per day for the year 1974, an increase of 0.9 million barrels per day from 1973. Aramco estimated its probable crude oil reserves at 172.5 billion barrels at yearend 1974 (up 4.9% from the yearend 1973 estimate), enough to last more than 57 years at the 1974 rate of production. The probable reserves included 103.5 billion barrels of proved oil reserves.

Saudi Arabian petroleum refinery output remained steady, and gross production of natural gas was estimated at 1,570.0 billion cubic feet, an increase of 9% from 1973. No significant increases in production were recorded by Saudi Arabia's nonpetroleum mineral commodities.

[12] Middle East Economic Survey (Beirut, Lebanon). Saudi Arabia Concludes 60–40 Participation Agreement With Aramco on Interim Basis. V. 17, No. 34, June 14, 1974, p. 2.

[13] Where necessary, values have been converted from Saudi Arabian riyals (SRls) to U.S. dollars at the rate of SRls3.55 = US$1.00.

[14] Middle East Economic Survey (Beirut, Lebanon). Saudi Revenues Reach $22.6 Billion in 1974. V. 18, No. 39, July 18, 1975, p. 2.

[15] Petroleum Intelligence Weekly. Saudi Tankers to Get "Preference" on Oil Exports. V. 13, No. 49, Dec. 9, 1974, p. 3.

Table 4.—Saudi Arabia: Production of mineral commodities [1]

| Commodity | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| METALS | | | | |
| Steel semimanufactures, hot rolled | metric tons | 10,076 | NA | NA |
| NONMETALS | | | | |
| Cement, hydraulic | thousand metric tons | [r] 964 | 1,028 | [e] 1,050 |
| Gypsum [e] | do | 45 | 45 | 45 |
| Lime | do | [2] 13 | [e] 15 | [e] 15 |
| Sulfur [e] | do | 5,000 | 5,000 | 5,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Gas, natural: | | | | |
| Gross production | million cubic feet | 1,126,974 | [e] 1,440,000 | [e] 1,570,000 |
| Marketed production | do | 98,578 | [e] 160,000 | [e] 219,000 |
| Natural gas liquids: | | | | |
| Propane and butane | thousand 42-gallon barrels | 15,784 | 25,628 | NA |
| Natural gasoline and other | do | 4,007 | 9,822 | NA |
| Total | do | 19,791 | 35,450 | 50,200 |
| Petroleum: | | | | |
| Crude | do | 2,098,422 | 2,677,146 | 2,996,543 |
| Refinery products: | | | | |
| Gasoline | do | 30,873 | [3] 44,900 | 43,813 |
| Jet fuel | do | 16,323 | 13,413 | 7,827 |
| Kerosine | do | 5,042 | 5,217 | 7,431 |
| Distillate fuel oil | do | 23,410 | 26,948 | 27,521 |
| Residual fuel oil | do | 119,413 | 101,663 | 91,854 |
| Other: | | | | |
| Liquefied petroleum gas | do | 15,854 | 25,674 | 37,939 |
| Naphtha | do | 6,171 | ([3]) | -- |
| Asphalt | do | 939 | 1,574 | 1,912 |
| Unspecified | do | 70 | | -- |
| Refinery fuel and losses | do | 7,044 | 5,662 | 7,025 |
| Total | do | 225,139 | 225,051 | 225,322 |

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Includes Saudi Arabia's one-half share of crude oil and natural gas production in the Kuwait-Saudi Arabia partitioned zone, and Saudi Arabia share of refinery output by its concessionaires in that area.

[2] Data presented are for Hejira calendar year 1392 (February 16, 1972-February 3, 1973).

[3] Naphtha apparently included in gasoline.

## TRADE

Crude oil and refined petroleum products were the major exports, and Saudi Arabia maintained its position as the world's largest oil exporter. Aramco was the dominant exporting company, and more than one-half of the company's petroleum shipments went to European markets. The fourth-quarter 1973 oil embargo by Saudi Arabia and the other Arab oil exporters against selected countries continued into 1974. Saudi Arabia lifted the embargo on oil shipments to the United States on March 18, 1974; the first post-embargo Saudi Arabian oil reached the United States on April 30.

Aramco loaded 4,470 tankers with 2,659 million barrels of crude oil and 204.8 million barrels of refined petroleum products in 1974, an increase in ships loaded of 8.2% from that of 1973. More than one-half of the company's petroleum exports went to Europe. Of Aramco's 2,997 million barrels of crude oil produced in 1974, 2,656.4 million (or 88.7%) was destined for export at Saudi Arabia's Persian Gulf ports. Only 87.5 million barrels (2.9% of the total) went to Al Qaysumah to be exported by the Trans-Arabian Pipeline (TAPline), down 69.8 million barrels or 44.4% from 1973. Nearly 64.8 million barrels (2.2% of the total) was destined for Bahrain, and the remaining 187.9 million barrels (6.3%) of the crude oil was for field use or sent to the Ras Tanura refinery for processing.

Crude oil shipments to the Mediterranean Sea through the TAPline declined steadily during 1974, from 290,559 barrels per day in the first quarter of the year to 86,825 barrels per day in the fourth quarter (only 17.4% of the pipeline's 500,000-barrel-per-day capacity) and averaged only 175,555 barrels per day for the year. Reduced shipping rates on supertankers had made it more economical to transport oil to Europe from Ras Tanura than to pump it through TAPline to be loaded onto tankers on the Mediterranean Sea.

Table 5.—Saudi Arabia: Exports of crude petroleum and petroleum refinery products [1]
(Thousand 42-gallon barrels)

| Commodity | 1972 | 1973 | 1974 |
|---|---|---|---|
| Crude petroleum | 1,992,487 | 2,560,342 | 2,897,924 |
| Petroleum refinery products: [2] | | | |
| Shipments other than bunkers: | | | |
| Gasoline | 28,320 | 38,435 | 36,680 |
| Jet fuel | 13,675 | 3,092 | 2,067 |
| Kerosine | 3,500 | 1,318 | 2,395 |
| Distillate fuel oil | 27,409 | 13,784 | 12,842 |
| Residual fuel oil | 47,200 | 35,108 | 18,388 |
| Other | 17,448 | 26,775 | 38,577 |
| Total | 137,552 | 118,512 | 110,949 |
| Bunkers: | | | |
| Distillate fuel oil | 842 | 1,000 | 1,279 |
| Residual fuel oil | 60,598 | 72,477 | 76,997 |
| Total | 61,440 | 73,477 | 78,276 |

[1] Includes Saudi Arabia's share of exports from the Kuwait-Saudi Arabia partitioned zone.
[2] Excludes exports (if any) by General Petroleum and Mineral Organization (Petromin).

Table 6.—Saudi Arabia: Aramco petroleum exports, by destination
(Percentage of totals)

| Area | 1972 | 1973 | 1974 |
|---|---|---|---|
| Africa | 3.2 | 3.4 | 1.4 |
| Asia | 29.1 | 29.2 | 30.4 |
| Australia | .7 | .7 | .7 |
| Europe | 56.5 | 52.0 | 51.3 |
| North America | 4.5 | 5.2 | 4.9 |
| South America | 6.0 | 9.5 | 11.3 |
| Total | 100.0 | 100.0 | 100.0 |

## COMMODITY REVIEW

Exploration for nonpetroleum minerals continued in 1974 by the Directorate General of Mineral Resources (DGMR). Licenses were issued to several foreign companies to develop copper reserves at Jabal Sa'id and to explore for copper, gold, lead, mercury, silver, and zinc in the Negrah area.[16] DGMR test drilling was reportedly underway at a gold-zinc deposit at Al Amar, 200 kilometers southwest of Riyadh.[17] Saudi Arabia and Sudan signed an agreement to develop the natural resources along a 480-kilometer stretch of the Red Sea between the two countries. The area is rich in seabed and subsoil minerals.[18] Settlement of a long-standing border dispute was negotiated by Saudi Arabia and Abu Dhabi. The disputed area included a potentially rich oilfield.

**Metals.**—A discovery of massive sulfides at Al Masani was announced by the Arabian Shield Development Co. Initial drilling revealed over 30 meters of sulfides with an average grade of 2.0% copper and 5.0% zinc with traces of gold and silver. Arabian Shield continued exploratory operations in the nearby Wadi Qatan area where nickel was discovered in 1972.[19]

*Copper.*—Saudi Arabia issued a license to the French Bureau de Recherches Géologiques et Minières and the United States Steel Corp. to explore for copper in the Jabal Sa'id deposit, approximately 140 kilometers southeast of Yanbu'. Terms of the license included development rights if copper is discovered.[20]

*Iron and Steel.*—Early in 1974 a feasibility study was carried out concerning the establishment of a major steel production plant at Al Jubayl on the Persian Gulf, and in March the Government approved the project. The $500 million project, a joint venture between the General Petroleum and Mineral Organization (Petromin) and a group of foreign concerns headed by the Marcona Corp. of the United States, will have an initial yearly production capacity of 3.5 million tons of prereduced pellets and 1 million tons of crude steel.[21] Two Japanese firms, Sumitomo Metal Industries, Ltd. and Sumitomo Shoji Kaisha, Ltd., have joined a group of Saudi Arabian investors in forming the National Pipe Co., which will produce spiral steel pipes for the petroleum indus-

[16] Metals Sourcebook. Copper. V. 2, No. 16, Aug. 26, 1974, p. 4.
[17] Mining Journal. Broader Minerals Base. V. 283, No. 7246, July 5, 1974, p. 7.
[18] The Petroleum Economist. Joint Development Agreement. V. 41, No. 7, July 1974, p. 256.
[19] World Mining. Saudi Arabia. V. 27, No. 8, July 1974, p. 67.
[20] Chemical Engineering. U.S. Steel will Seek Copper Ore in Saudi Arabia. V. 81, No. 12, June 10, 1974, pp. 34–35.
[21] Mining Journal. Steel Complex Start Signalled. V. 282, No. 7232, Mar. 29, 1974, p. 229.

try.[22] The $26.6 million plant will be built near the port of Ad Dammam and will turn out approximately 80,000 tons of pipes per year, beginning in 1976.

**Nonmetals.**—*Cement.*—Saudi Arabia negotiated contracts during the year to purchase large quantities of cement from Japan, South Korea, and Taiwan. Saudi Cement Corp. signed an $80 million turnkey contract with a West German firm to expand the Al Hufuf plant by 1 million tons per year, in an effort to satisfy the country's growing demand for cement.[23] Three new cement plants may be built in Saudi Arabia, one at Al Qasim, the second at Yanbu' and the third at an undisclosed location in the southern part of the country.

**Mineral Fuels.**—*Natural Gas.*—Petromin approved an extensive natural gas project, which will utilize large quantities of natural gas to produce LPG and natural gasoline for domestic industries and export. Costs of the project may exceed $3 billion for gathering, separation, and treatment facilities, and the volume of gas to be processed will be about 5.2 billion cubic feet per day. Saudi Arabia's natural gas reserves were estimated to be 55 trillion cubic feet at yearend 1974. Houston Natural Gas Corp. revealed plans to build a methanol plant in Saudi Arabia that would produce the fuel at a rate of 12,500 tons per day, and a West German firm was negotiating a $100 million nitrogenous fertilizer project with Saudi Arabia.[24] A Taiwan fertilizer company expressed interest in building a plant in Saudi Arabia that would produce 1,000 tons of urea per day, also using natural gas feedstocks.

*Petroleum.*—At the beginning of 1974, the posted price of Saudi Arabia's Arabian Light Crude Oil f.o.b. Ras Tanura was $11.651 per barrel. During the year OPEC recommended changes to the oil pricing formula, and in November, Saudi Arabia notified Aramco of its decision to implement the OPEC decisions. The posted price of crude oil was cut 40 cents, income tax rates were increased to 85% from 65.75%, and royalty rates were raised to 20% from 16⅔%. The Government also set the price of buy-back oil at 94.85% of the posted prices, instead of 93%.[25]

*Arabian American Oil Co. (Aramco).*—Exploration activities increased from the 1973 level, and a new oil discovery was made at Rimthan, 95 kilometers east of Al Qaysumah. Four offshore and 17 onshore drilling rigs were employed during the year, and company crews drilled 300 wells for oil exploration, production, and pressure maintenance. Twelve water injection facilities were constructed and placed in service at Berri and Ghawar oilfields. At the yearend, Aramco's water-injection facilities had a total daily capacity of 9.3 million barrels of nonpotable water. Company gas-oil separator plant facilities were expanded significantly during the year. An additional compression plant was completed at the Abqaiq NGL complex, and Aramco commenced the construction of yet a larger compression plant at Abqaiq. A gas compression-treatment plant capable of producing NGL at rates up to 31,000 barrels per day was completed at Ras Tanura. Butane vapor recovery and propane auto-refrigeration plants were built nearby. NGL production totaled 50.2 million barrels in 1974, an increase of 14.8 million barrels or 41.8% over that of 1973. Aramco reported the construction of 471 kilometers of major crude oil and petroleum pipelines in 1974, compared with a total 565 kilometers of major pipelines laid in 1973.

Although crude oil runs to the Ras Tanura petroleum refinery fell to 176.1 million barrels in 1974 (482,411 barrels per day) from 189.2 million barrels in 1973 (518,300 barrels per day), the refinery's total 1974 throughput increased 0.6% to 224.3 million barrels (614,532 barrels per day) because of increased NGL throughput, excluding NGL produced from the crude oil processed at the refinery. The refinery's output totaled nearly 217.1 million barrels, at the average daily rate of 594,786 barrels. Output comprised diesel oil 12.51%, fuel oil 42.12%, gasoline 3.14%, jet fuel 3.6%, kerosine 3.4%, naphtha 11.21%, NGL 23.14%, and others 0.88%. Ras Tanura's refinery output had totaled 199.4 million barrels (544,925 barrels per day) in 1972 and 217.2 million barrels (595,145 barrels per day) in 1973.

Aramco's asphalt production capacity was nearly doubled when a 5,000-barrel-

[22] American Metal. Sumitomo, Arabia in Pipe Plant Deal. V. 81, No. 107, June 3, 1974, p. 35.
[23] Rock Products. Cement Excitement Abroad. V. 77, No. 10, October 1974, p. 17.
[24] Oil Daily. Saudis Tentatively Approve $3 Billion System To Process Presently Wasted Gas. No. 5657, June 4, 1974, p. 2.
[25] Petroleum Intelligence Weekly. Saudi "Bombshell" To Sharply Increase World Oil Costs. V. 13, No. 46, Nov. 18, 1974, pp. 1–3.

per-day plant went onstream at Ras Tanura increasing the company's asphalt producing capacity to 11,000 barrels per day.[26]

Ju'aymah, Aramco's newest deepwater tanker terminal located about 33 kilometers north-northwest of the Ras Tanura terminal, was completed and placed in service in November. The second phase of construction was in progress at Ju'aymah during 1974 and was scheduled to be completed in 1975.[27] It included an additional offshore single-buoy mooring and onshore storage tanks for 3.8 million barrels of crude oil.

Aramco employees totaled 15,657 at yearend 1974, of which 11,995 or 76.6% were Saudi Arabians. The remaining employees included 1,418 U.S. citizens.

*General Petroleum and Mineral Organization (Petromin).*—A Japanese firm completed the construction of a small 15,000-barrel-per-day petroleum refinery for Petromin near Riyadh, and the new plant was placed onstream in September. A 30-centimeter, 141-kilometer crude oil pipeline was built from Aramco's Khurays oilfield to the refinery. Production from the Riyadh refinery will include bitumen, diesel oil, fuel oil, kerosine, LPG, and motor gasoline. Earlier in the year Petromin signed an agreement with Mobil Oil Corp. to build a $36 million lubricating oil refinery at Jidda. The 2,740-barrel-per-day plant will be a joint Mobil-Petromin project and is expected to be onstream in 1977. Petromin also approved plans to increase the capacity of the Jidda Petrolube blending plant from its present yearly capacity of 70,000 barrels to 300,000 barrels.

Petromin held separate discussions with several foreign oil companies during the year to jointly build large petroleum export refineries in Saudi Arabia. Mobil Oil Corp. and Royal Dutch/Shell Group each proposed building large refinery/petrochemical complexes in the country, but neither project had been approved by yearend. Each of the proposed refineries would have a capacity to process about 500,000 barrels of crude oil per day. Gulf Oil Corp. also negotiated with Saudi Arabia to build a jointly owned refinery and petrochemical complex in the country that would have an initial capacity of 250,000 barrels per day.

The Mitsubishi Industrial Group of Japan reached an agreement with Saudi Arabia to build a $3 billion petroleum refinery and petrochemical complex at Al Jubayl as a joint venture with Petromin. The refinery's initial throughput capacity was set at 250,000 barrels per day.

*Getty Oil Co. (Getty).*—Oil production in the Neutral Zone ranged from 53,000 to 68,000 barrels per day from October 1973 to March 1974, the period of the oil embargo. More normal production rates resumed after the curtailments were lifted, and the company's 1974 oil production from the Neutral Zone averaged 82,000 barrels per day.

Getty held discussions with the Aminoil (oil producer in Kuwait's section of the Neutral Zone) regarding exploration and development programs that would involve expenditures of approximately $5 million by each company. A proposed field development program would involve drilling eight additional development wells in the Ratawi reservoir.[28]

[26] Aramco. A Review of Operations by the Arabian American Oil Co. 1974, pp. 3–11.
[27] Petroleum Intelligence Weekly. Saudi Arabia. V. 13, No. 49, Dec. 9, 1974, p. 12.
[28] Wall Street Journal. Union Oil May Spend Up to $30 Million on Exploration, Development in Egypt. V. 183, No. 77, Apr. 19, 1974, p. 4.

# The Mineral Industry of Liberia

By Janice L. W. Jolly [1]

The mineral industry of Liberia consisted primarily of iron ore and diamond production, which together accounted for an estimated $292 million [2] in exports in 1974. The Liberian Bureau of Mines reported that interest in gold mining had gained momentum with fees being collected from 57 prospecting and 32 gold mining licenses.[3] Growth was also reported in petroleum refining and cement production. Offshore petroleum exploration continued and the Liberia Refining Co. (LRC) reported production of petroleum products worth $28.4 million for the first 8 months of 1974 compared with $10.2 million for the same period in 1973. The depressed world diamond market resulted in a decline in the quantity and value of diamond exports and of revenues accrued from this industry. Iron ore continued to enjoy favorable market conditions despite global energy and monetary crises. Improved export performance in 1974 was due almost entirely to higher prices and increased volume of iron ore. In November 1974, the Association of Iron Ore Exporting Countries met in Geneva, Switzerland. Liberia had observer status in the organization.

Liberian iron ore producers incurred large cost increases as a result of higher refined oil prices, which had almost quadrupled since 1973. The average cost increase for imported oil to the iron ore, rubber, and timber concessions, which together account for 85% of Liberia's exports, was a staggering 411%.[4] Inflation abroad also affected Liberia's manufacturing industries since most raw materials were imported. Imports increased about 48% in value over those of 1973, with little change in volume. The gross domestic product gained 8.5% over the $521.2 million in 1973. However, population growth (3.2% per year) and inflation (19.5%) continued to effectively reduce this gain. The 1973 population was estimated at 1.67 million.

A new investment code was announced and was already being used by the Government in matters concerning new investments in all economic activities of Liberia.[5] The ultimate authority for approving, disapproving, or granting investment incentives would be vested in the Concessions and Investment Commission of the Ministry of Finance. The code superseded that of March 21, 1966. The Revenue and Finance Laws of 1956 (Title 35, Liberian Code of Laws) were also revised. A 43% increase in revenues in the first half of 1974 came mainly from consular invoice fees, maritime revenues and direct taxes. The revised tariff schedules developed in 1973 were enacted into law in 1974. The National Bank of Liberia was established by an Act of Legislature on May 27, 1974, and formally opened on July 22. The bank was to handle all government accounts and will license, inspect, supervise, and regulate commercial banks and other financial institutions.[6] Air Liberia came into operation in April 1974. On August 15, 1974, the Engineering School of the T.J.R. Faulkner College of Science and Technology came into being with departments in geology, civil engineering, mining, and electrical and architectural engineering.

The Mano River Declaration signed in October 1973 by Sierra Leone and Liberia

[1] Physical scientist, Division of Ferrous Metals.
[2] Liberia uses U. S. dollar currency.
[3] Liberia Ministry of Lands and Mines. Annual Report for the period January 1, 1974 to December 31, 1974.
[4] Page 51 of work cited in footnote 3.
[5] U. S. Embassy, Monrovia, Liberia. State Department Airgram, A-99, Nov. 4, 1974.
[6] Journal of Commerce, Industry and Transportation (Liberia). Special ed., October 1974, p. 14.

provided economic agreements between the two countries designed to remove some of the constraints imposed in their economic developments by the small size of their domestic markets. In 1974 Liberia participated in a number of conferences with Sierra Leone on produce inspection and grading, hydropower and irrigation, and transportation. A joint standards bureau would be established, and bulk purchasing of crude oil and fertilizers were also discussed. A draft treaty creating the Economic Community of West African States (ECOWAS) was scheduled for approval at a Ministerial Conference in Monrovia to be held in January 1975. Ratification by seven States would bring ECOWAS into existence. The seventh meeting of the Technical Exports Committee on Liberian/Ivorian Cooperation met and agreed upon an exchange of experts, students, and businessmen. Technical experts from Gambia and Liberia also met in Monrovia to examine and clarify the trade agreement between them.

During 1974, draft trade agreements were exchanged with Argentina, Ghana, Czechoslovakia, and Romania. Romania agreed to undertake joint projects with Liberia which would include: (1) Iron and steel manufacturing; (2) a fertilizer plant; (3) participation in the development of the Wologisi iron ore concession; (4) geological studies and prospecting; and (5) training of Liberian students in the University of Bucharest. A special office staffed by four Romanian and two Liberian geologists was set up in Monrovia to conduct a wide range of research exploration and feasibility studies.[7] A $700 million investment is visualized for the iron and steel industry, with $490 million being provided by foreign capital and $210 million by domestic capital. The project is expected to commence in 1976 and to continue for 7 years. Rolled steel products would be made from 1 million tons per year of raw steel. A Sri Lanka industrial company was also reportedly interested in setting up a galvanized sheet factory.

The U.S. Export-Import Bank authorized credit of $1.7 million to finance part of a $5.7 million sale of U.S. mining equipment to Bong Mining Co. (BMC). Another credit of $3.1 million would come from private sources. It was expected that $3 million would be spent on the establishment of a free zone in Liberia. The project was approved by the United Nations Industrial Development Organization (UNIDO) in 1974. UNIDO contracted Sir Alexander Gibb and Partner (United Kingdom) to conduct a feasibility study on two areas. The funding would be made through the Special Services Program (SIS) of UNIDO.[8] Maintenance, improvement, and rehabilitation of 700 miles of roads were being financed through the World Bank and the International Development Association (IDA), with technical aid from the Federal Republic of Germany. Allgemeine Bau Union (ABU) of Frankfurt was to build a bridge over the Mano River at a cost of $2.9 million. The German Team for Public Utilities Authority (GKW) continued to make feasibility studies to provide water for several Liberian cities. The African Development Bank (ADB) authorized a loan of $1.2 million for waterworks expansion. Gas or diesel turbines were being considered for expansion, by early 1976, of the Liberian Public Utilities Authority's (PUA) generator capacity to cope with increased demand and have reserve power for emergencies.

The Liberian Geological Survey was undertaking groundwater surveys in cooperation with the Hydrological Services. The Geochemical Laboratory continued to provide assistance to prospectors and the public with rock identifications. The Geological Survey formulated a 5-year plan for improving the effectiveness of the Survey in conducting a long-range mineral resources evaluation program. Gold exploration was to be given foremost consideration, and a gold quantification program was launched during 1974 as a precursor to the more extended 5-year mineral evaluation program. The following commodities were to be examined on a priority basis to quantify deposits located during the Geological Exploration and Resource Appraisal (GERA) project conducted by the Liberian and U.S. Geological Surveys, and completed in 1972: (1) eastern region—gold, base metals, bauxite; (2) western region—gold, chromite, bauxite; and (3) central region—gold, tin, base metals. As a result of GERA, several geological quad-

[7] Pages 4–5 of work cited in footnote 6.

[8] Liberia Ministry of Commerce, Industry and Transportation. Annual Report to the Fourth Regular Session of the Forty-Seventh Legislature of the Republic of Liberia on the Operation and Activities of the Ministry of Commerce, Industry and Transportation, for the period Jan. 1, 1974, to Dec. 31, 1974, p. 24.

rangle maps [9] were scheduled for release in 1975, including the Zwedru, Harper, Juazohn, Monrovia, Gbanka, Zorzor, Buchanan, Sonohele, Bopolu, Vinjama, and Sanniquelle quadrangles.

A total of 73 new mining claims were surveyed by the Liberian Bureau of Mines, of which 10 were for gold. LAMCO J.V. Operating Co. applied for a mining concession for all minerals within 10 miles of the railway line from Buchanan to Nimba. Liberian Beach Sands Exploitation Co. (LIBSEC) prospecting for heavy minerals relinquished all but 55 square miles of its area after completing the required 1 year of exploration. Globex Minerals (Liberia) Inc. applied for a concession to explore for heavy mineral concentrates along the Grand Bassa-Grand Cape Mount County coastline. Clayco Petroleum Corp., a United States firm, reportedly [10] also explored for minerals in the coastal sands between Grand Cape Mount and Grand Bassa Counties in 1973.

## PRODUCTION AND TRADE

Liberia's export earnings valued at $400.3 million in 1974 were heavily dependent on two commodities—iron ore (65%) and rubber (19.3%). Diamonds accounted for 7% of the total export value. Iron ore production increased 1% in 1974 to 23.8 million tons valued at $212.4 million. This compares with the 23.5 million tons produced in 1973 valued at $182 million. A total of 18 countries imported Liberian iron ore with West Germany, the Netherlands, Italy, the United States, France, Belgium, and Japan as the leading importers, listed in decreasing order.

A total of 635,719 carats of diamonds valued at $29.9 million were exported during 1974, representing a decrease from the 812,257 carats valued at $49.3 million exported in 1973. Diamond exports went to Belgium, the United Kingdom, Israel, the United States, and the Netherlands.

Total import costs in 1974 were estimated at $286 million, up 48.1% over those of 1973. The value of mineral fuel imports increased to $42.4 million in the first three quarters of 1974 compared with 9.9 million in the same period of 1973. Most Liberian crude oil was from Saudi Arabia which supplied 3.9 million barrels of the total 4.2 million barrels of crude oil imported in 1974 by LRC.

Liberia's trade with the rest of Africa registered an increase of 7% in the first 8 months of 1974 over the same period in 1973. The 1974 value amounted to an estimated $3.1 million. Mauritania, Ghana, Mali, and the Ivory Coast were the largest trading partners. The European Economic Community (EEC) accounted for 65% and the United States 25.4% of the total Liberian trade for 1974.

Table 1 shows production and tables 2 and 3, trade data.

[9] U. S. Geological Survey (Reston, Va.). Open File Reports, 1975.
[10] World Petroleum Report. Liberia. V. 19, 1973, p. 64.

**Table 1.—Liberia: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| **METALS** | | | | |
| Gold [2] | troy ounces | [r] 23 | 4 | |
| Iron ore | thousand metric tons | 22,509 | 23,542 | 23,785 |
| **NONMETALS** | | | | |
| Cement, hydraulic | do | 91 | [r] e 90 | e 100 |
| Diamond: [3] | | | | |
| Gem | thousand carats | 414 | 509 | 377 |
| Industrial | do | 350 | 308 | 259 |
| Total | do | 764 | 817 | 636 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | |
| Petroleum refinery products: | | | | |
| Gasoline | thousand 42-gallon barrels | 574 | 497 | 507 |
| Jet fuel | do | 142 | 205 | 259 |
| Kerosine | do | 88 | 91 | 81 |
| Distillate fuel oil | do | 1,125 | 1,646 | 1,351 |
| Residual fuel oil | do | 1,553 | 1,304 | 1,527 |
| Other | do | 137 | 23 | 28 |
| Refinery fuel and losses | do | 226 | 223 | 254 |
| Total | do | 3,840 | 3,989 | 4,007 |

e Estimate. p Preliminary. r Revised.
[1] In addition to the commodities listed, a variety of crude construction materials such as clays, stone, sand, and gravel were produced but available data is inadequate to make reliable estimates of output levels.
[2] Purchases by the Bank of Monrovia.
[3] Exports.

## Table 2.—Liberia: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Gold metal, bullion ____ troy ounces __ | [1]1,200 | -- | |
| Iron and steel: | | | |
| Ore and concentrate thousand tons __ | 22,978 | 25,574 | Netherlands 5,142; United States 2,892; Japan 2,527. |
| Semimanufactures _____ | 12 | 44 | Guinea 26; Gambia 18. |
| Silver metal including alloys troy ounces __ | -- | 581 | All to Ghana. |
| Other, nonferrous metal scrap _ value __ | $217,705 | $326,536 | Norway $158,197; West Germany $114,487; Japan $20,731. |
| **NONMETALS** | | | |
| Abrasives, natural, grinding and polishing wheels and stones, n.e.s _____ | -- | 19 | All to West Germany. |
| Cement _____ | 33 | 266 | Sierra Leone 225; Guinea 39; Gambia 2. |
| Diamond, industrial _____ carats __ | 879,575 | 812,257 | Belgium-Luxembourg 566,995; United Kingdom 136,364; Israel 95,059. |
| Salt _____ | ([2]) | -- | |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Gas, hydrocarbon _____ value __ | $3,200 | -- | |
| Petroleum refinery products: | | | |
| Gasoline _____ 42-gallon barrels __ | 7,622 | 5,785 | All to Guinea. |
| Distillate fuel oil _____ do ____ | -- | 61 | Do. |
| Residual fuel oil _____ do ____ | 227 | -- | |
| Lubricants _____ do ____ | 6 | 524 | All to Sierra Leone. |
| Nonlubricating oils _____ value __ | $1,336 | -- | |

[1] Includes ore.
[2] Less than ½ unit.

## Table 3.—Liberia: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| Aluminum: | | |
| Oxide and hydroxide _____ | 134 | ([1]) |
| Metal including alloys, all forms _____ | 326 | 519 |
| Chromium oxide and hydroxide _____ | 1 | 20 |
| Copper metal including alloys, all forms _____ | 28 | 21 |
| Gold metal, bullion and unworked or partly worked ____ troy ounces __ | 700 | NA |
| Iron and steel metal: | | |
| Scrap _____ | 225 | -- |
| Pig iron, ferroalloys, similar materials _____ | 2,088 | 17 |
| Steel, primary forms _____ | 1,603 | 81 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections _____ | 2,450 | 3,003 |
| Universals, plates, sheets _____ | 5,048 | 6,099 |
| Hoop and strip _____ | 1 | 46 |
| Rails and accessories _____ | 1,109 | 1,400 |
| Wire _____ | 18 | 47 |
| Tubes, pipes, fittings _____ | 1,491 | 2,698 |
| Castings and forgings, rough _____ | 417 | 1,376 |
| Lead metal including alloys, all forms _____ | 36 | 25 |
| Mercury _____ 76-pound flasks __ | 1 | -- |
| Nickel metal including alloys, all forms _____ | ([1]) | ([1]) |
| Platinum-group metals and silver: | | |
| Ore and concentrate _____ value __ | -- | $412 |
| Metals including alloys: | | |
| Platinum group _____ troy ounces __ | 7 | 21 |
| Silver _____ do ____ | 11 | 3,424 |
| Tin metal including alloys, all forms _____ long tons __ | r ([1]) | -- |
| Zinc metal including alloys, all forms _____ | 1 | 10 |
| Other: | | |
| Ore and concentrate of nonferrous base metals _____ value __ | -- | $388 |
| Nonferrous metal scrap _____ do ____ | $35 | $813 |
| Oxides, hydroxides, peroxides of metals, n.e.s _____ | r 87 | 184 |
| Metals including alloys, all forms: | | |
| Metalloids _____ | 24 | 7 |
| Alkali, alkaline earth, rare-earth metals, n.e.s _____ | 6 | 15 |
| Base metals including alloys, all forms, n.e.s _____ | 1 | -- |

See footnotes at end of table.

## Table 3.—Liberia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| **NONMETALS** | | | |
| Abrasives, natural, n.e.s.: | | | |
| Grinding and polishing wheels and stones | | 16 | 387 |
| Other | value | $2,329 | $77,361 |
| Asbestos | | 281 | 10 |
| Boron materials, oxide and acid | | -- | 2 |
| Cement | | 42,223 | 59,483 |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s | | 28,092 | 1,337 |
| Products: | | | |
| Refractory (including nonclay brick)[2] | | 273 | 159 |
| Nonrefractory[3] | | 3,138 | 495 |
| Diamond, industrial | carats | 331 | 278 |
| Fertilizer materials: | | | |
| Natural: | | | |
| Nitrogenous | | 140 | 1,561 |
| Phosphatic | | 682 | 89 |
| Potassic | | 46 | -- |
| Manufactured: | | | |
| Nitrogenous | | 11,114 | 9,376 |
| Phosphatic | | 1,698 | 1,213 |
| Potassic | | 542 | 715 |
| Other, including mixed | | 878 | 191 |
| Ammonia | | 1,777 | 1,318 |
| Gypsum and plasters | | 1,006 | 5,559 |
| Lime | | 1,067 | 1,027 |
| Pyrite (gross weight) | | -- | (4) |
| Salt | | 3,304 | 3,389 |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | | 2,509 | 1,218 |
| Caustic potash, sodic, potassic peroxides | | 290 | 27 |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | | 876 | 2,393 |
| Worked | value | $49,071 | $38,620 |
| Dolomite, chiefly refractory grade | | 3,647 | 16,791 |
| Gravel and crushed rock | | 441 | 6,070 |
| Sand, excluding metal bearing | | -- | 15 |
| Sulfur: | | | |
| Elemental (includes unroasted pyrites) | | -- | 107 |
| Sulfur dioxide | | 1 | -- |
| Sulfuric acid | | 135 | 77 |
| Other nonmetals, n.e.s.: | | | |
| Crude | value | $206 | $16,502 |
| Slag, dross and similar waste, not metal bearing | | 19,358 | -- |
| Oxides and hydroxides of magnesium, strontium, barium | | 1 | -- |
| Bromine, iodine and fluorine | | (1) | 2 |
| Building materials of asphalt, asbestos, fiber cement, and unfired nonmetals, n.e.s | value | $521,918 | $497,466 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Asphalt and bitumen, natural | | 9,678 | 8 |
| Carbon black | | -- | 4 |
| Coal and coke, including briquets | | 21 | 11,040 |
| Hydrogen and other rare gases | value | $4,329 | $14,737 |
| Petroleum: | | | |
| Crude and partly refined | thousand 42-gallon barrels | r 3,524 | 3,276 |
| Refinery products: | | | |
| Gasoline | do | 10 | 7 |
| Kerosine and jet fuel | do | (1) | 1 |
| Distillate fuel oil | do | 1 | 8 |
| Residual fuel oil | do | 1 | (1) |
| Lubricants[5] | do | 78 | 111 |
| Other: | | | |
| Liquefied petroleum gas | value | $2,513 | $13,460 |
| Mineral jelly and wax | thousand 42-gallon barrels | (1) | 1 |
| Nonlubricating oils, n.e.s | value | $29,689 | $26,247 |
| Unspecified | do | $43,626 | $53,357 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | 28 | 32 |

r Revised. NA Not available.
[1] Less than ½ unit.
[2] Excludes quantity valued at $119,493 in 1972 and $29,168 in 1973.
[3] Excludes quantity valued at $20,418 in 1972 and $34,436 in 1973.
[4] Included with sulfur.
[5] Excludes quantity valued at $6,009 in 1972 and $27,499 in 1973.

# COMMODITY REVIEW

## METALS

**Gold.**—With the price of gold at record highs on the free market, a number of gold miners were reported to be shifting from diamond to gold mining. The Ministry of Lands and Mines commenced a campaign to persuade more investment in gold mining. During 1974, however, the Government was unable to purchase gold through the Bank of Liberia. Reportedly, all gold recovered from mining operations was sold to jewelers. There are no statistics available on production and consumption of gold even though this mineral was mined. The Ministry was expected to reestablish the vendor's certificate system for all gold sales in 1975.[11] African Mining Partners (AMP) started exploration for gold in Grand Cape Mount County when its 25-year agreement with the Government became effective on August 1, 1973. Exploration was centered mainly around Weaju and Butter Hill, with some reconnaissance and auger tests around the Mano Godua area and in Grand Gedeh County near Zia Town. Analytical results have been reported as encouraging. In January 1974 AMP applied for exploration rights in the following areas: (1) Juazohn, Sinoe County—75 square miles; (2) Zwedru, Grand Gedeh County—91 square miles; and (3) Bopolu, Lofa County—75 square miles. Senwein Mining Corp. also applied for a gold mining concession in 1974. The Liberian Geological Survey launched a gold quantification program, collecting samples in the Kokoya District, Beng-Gola-Todee District, and the Gbarsee Giah area. Of 263 heavy mineral concentrate samples collected from western and central Liberia, a total of 119 contained native gold. One sample from Kokoya area assayed $274.50 gold per ton of gravel. None of the three creeks investigated in the Gume section of Uahun showed significant gold values.

**Heavy Minerals.**—Exploration by LIBSEC for heavy minerals in Sinoe County west of Harper and Garawe and near Greenville gave discouraging results. It was thought that a small-scale operation might be feasible depending on mineral dressing studies and market demand. Preliminary estimates by LIBSEC indicated 900,000 tons of heavy minerals consisting of rutile, ilmenite, zircon, and monazite.

**Iron Ore.**—Liberian Iron and Steel Corp. (LISCO) subsidiary of the New York-based Liberian International American Corp. (LIAC), with Romanian interests, signed a formal agreement on Oct. 11, 1974, with the U.S. firm American Metals Climax, Inc. (AMAX) and a group of Japanese companies including Kawasaki Steel Corporation, C. Itoh and Co., Ltd., Nisaho-Iwai Co., Ltd., Marubeni Corporation, and Toyo Menka Kaisha, Ltd. Under the agreement, the Japanese group and AMAX, after acquiring an initial block of LISCO shares, would have the right to purchase a 51% interest in LISCO and was to provide the estimated $600 million needed to develop the deposit and pelletize the ore. LISCO had its concession agreement for the Wologisi Mountain range reviewed. It was passed by the Liberian Legislature on July 19, 1974. The new agreement set the date of commercial production to September 1981. Full production was for 10 million tons or more of iron ore pellets per year. Feasibility studies were being made by a group from the Bechtel Corp. (United States). The facilities of the LISCO geological section were being upgraded in preparation for premining activities. Ore reserves were reported as being adequate to make the project viable, and thus efforts were being made toward proving the inferred ore reserves of the Balagizi ore body, clarifying the structural complexity of the main ore body, and extending the Maasoh Road for better access to drilling sites at Balagizi. The estimated minable ore reserves are nearly 900 million tons, ranging in grade from 35% to 54% iron, with about 40-micron grain size, and a probably additional reserve of 250 million tons of low-grade ore in Lofa County near the border with Guinea. Transportation and port facilities must also be constructed. A pelletizing plant is to be built at the port.

The Guinean Iron Mining Co. of Guinea (MIFERGUI) was set up in June 1973 to mine the iron deposits of Mount Nimba, located astride the Guinean–Liberian border. The basic agreement was signed by Guinea (holding 50% of the shares and chairmanship of the board) and Nigeria, Algeria, Zaire, and Liberia, as well as the

[11] Pages 30–31 of work cited in footnote 3.

following companies: Rudi and Energoprojekt (Yugoslavia), Nichimen Trading Co. and Mitsubishi (Japan), Instituto Nacional de Industria (INI) (Spain), and Intermaritime Bank, ALUSUISSE (Switzerland). The Belgian firm Becsa pulled out of the arrangements in August 1973, and the shares were taken up by Nichimen. United States Steel Corp. was reportedly considering participation. Nigeria is reported to have invested $100,000 and is expected to obtain a minimum of 1 million tons per year of iron ore for its planned iron and steel industry. Now joining the effort is Romania, which will build the ironworks for Guinea. Annual production was expected to be 15 million tons, and reserves were estimated to be between 300 million and 600 million tons. In addition, the MIFERGUI-Simandou mine was to start operating in 1982 with a production of 25 million tons. Both MIFERGUI-Nimba and MIFERGUI-Simandou planned to export ore via the Liberian American–Swedish Minerals Co. (LAMCO) transportation facilities through Buchanan in Liberia, as well as through Conakry, Guinea.

In November 1974, the LAMCO-Joint Venture (LAMCO–JV) Operating Co. restructured its organization to include two Liberians on the managerial staff for the first time. LAMCO holds 75% of LAMCO–JV, Liberia's largest iron mine. Bethlehem Steel (The Liberian Bethlehem Iron Mines Co.) owns 25%. LAMCO itself is 50% owned by the Government and 50% by Liberian Iron Ore Ltd. (LIO). LIO is a Canadian mining company that is 74.8% owned by Trafik A. B. Grängesberg Oxelosund (TGO) and 25.2% by an American group. Gränges International Mining (Gränges) manages LAMCO. A wildcat strike in February and March 1974 caused a production loss of about 250,000 tons, but the target of 12 million tons was still exceeded for the year. Reserves were estimated to be 100 million tons proven with 53% iron in addition to 150 million tons of high-grade 64% iron, with another 33 million tons probable. The new Tokadeh mine began production in 1973, and there were still an estimated 15 years of reserves at the Nimba mine. Forty thousand tons per day is mined and shipped by company railroad to Buchanan where it enters the $51.4 million pelletizing and washing plant. LAMCO exploration activities were concentrated on the deposits of Betton, Yelliton, Gangra, and South Nimba.

The country's first iron mine, in the Bomi Hills, was expected to close late in 1975. Expansion projects at BMC's Bong Mine and at the LAMCO–JV's Nimba and Tokadeh mines were hoped to compensate for the eventual Bomi Hills mine closure. BMC is engaged in a $6 million expansion project for increasing mine and concentrating plant capacity to 7 million tons per year, an increase of about 600,000 tons over present capacity. A loan for mining equipment was obtained from the U.S. Export-Import Bank and private European sources. A second pelletizing plant and an 11th concentrate silo has been proposed, costing between $50 and $60 million, to bring pelletizing capacity of the Bong mine to 6.4 million tons per year. The possibility of mining ore deposits in the Putu Range in the southeastern part of the country was also being considered by BMC and would require an initial investment of more than $400 million. BMC exported 6.7 million tons, of which 2.4 million tons were pellets. This is a joint effort by the Government and West German and Italian steel producers.

Mine Management Associates, Ltd., a Liberian corporation owned 70% by the Government and private Liberian citizens, continued as managing agents for National Iron Ore Co. (NIOC). The exploration program on Hill "A," which began in 1973, showed satisfactory progress. Access roads were constructed making it possible to begin mining operations on two bench levels simultaneously. Ore reserve calculations and classification for final program evaluation were expected to be completed in 1975.

At NIOC's Mano River Mine, production and shipments continued at near normal levels during the first 6 months of 1974 despite continued difficulties. Problems associated with Mano II expansion continued to plague operations, dropping output by an estimated 400,000 tons over the comparable first 6 months in 1973. The mine was planned to produce 4 million tons per year, and in 1974 produced only 3.6 million tons. Mano II expansion included improvements for dewatering tailings, a tailings storage system, and tailings flow. The conveyor belt system and shiploading facilities were also improved.

The Liberia Mining Co. Ltd. (LMC), 59.18% owned by Republic Steel Corp., exported 2.1 million tons in 1974 and traded 20,394 tons of fines to NIOC. The firm also produced 15,798 cubic yards of crushed rock for construction purposes. Production costs were affected by shortages of materials in 1974 and long delays in delivery, as well as by the high cost of fuels. LMC's usable reserves were approximately 1.4 million tons of direct shipping ore and 1.7 million tons of mill feed, expected to produce approximately 600,000 tons of concentrate. LMC is approaching exhaustion of minable ore in the main Tubmanburg deposit. LMC continued exploration work near the Sierra Leone border where substantial ore reserves have been established in the Bie Mountain iron deposits. LMC has 50% interest in the Bie Mountain project, and the remainder is held by NIOC, which is 50% owned by the Government. A 3-month drilling program in the Bie Mountains was completed in March 1974, with further work needed to be done on metallurgical properties of the ore. The work force and equipment from Bomi Hills might be utilized in this mine development, and only a short spur line would be needed to connect Bie Mountain with the existing Mano River-Bomi Hills-Monrovia iron ore railway. The road from Monrovia to Tubmanburg is an unpaved all-weather road maintained by LMC.

**Tungsten.**—The Liberian Geological Survey encountered stolzite, a lead tungstate in one of the concentrates from the Gondaja area. It was found associated with gold and scheelite. The presence of stolzite and scheelite indicates that a further investigation should be made in this area for lead and tungsten mineralization.[12]

## NONMETALS

**Barite.**—Universal Mineral and Oil Co., Ltd. (Universal) applied for a concession in 1973 to mine barite deposits near Totota. Their plan of operation called for a complete gravity survey of potential areas followed by pitting and trenching.

**Cement.**—The Liberia Cement Corp. (CEMENCO) was in the process of experiments for improving the durability of its cement. Fineness and setting time of the cement were observed to be in line with ASTM type 1 cement. A Liberian standard on portland cement has been elaborated. Chemical and physical subcommittees of the technical committee for portland cement were reviewing the standard.

**Diamond.**—Late in 1972, the Government canceled an agreement with Diamond Mining and Management Inc. (DMM) because the company failed to post a performance bond as required. DMM's concession area along the Lofa River in western Liberia was then transferred to Globex Minerals (Liberia) Inc. Globex was operating on a yearly basis rather than a seasonal one in 1974 and exploration was increased by auger drilling, testing, and prospecting. Exploration was planned for the entire concession of 31 exploration blocks, each consisting of approximately 50 acres. From January to December 1974, 10,611.09 carats were retrieved at the average rate of 1.29 carats per cubic yard of gravel. Phoenix Mining Corp. applied for a diamond mining concession during 1974. The Diamond Corp. of West Africa (DCWA), a subsidiary of De Beers of London, continued to operate the Diamond Appraisal Office. The first of two Liberian trainees was scheduled to leave for London early in 1975 for training by the DCWA. The Government levies a 15% tax on 20% of the export value of diamonds. This is a revenue-only measure, and there are no restrictions on the number of stones or carats which may be exported. The law is designed to encourage local production. Smuggling of diamonds into Liberia from neighboring Sierra Leone continued, and it was estimated that the actual sales are probably about five times the published figures. The Liberian diamond market was very sluggish in 1974.

## MINERAL FUELS

**Petroleum.**—Universal Mineral and Oil, Ltd. of the British West Indies (a Cayman Islands Co.) was granted a 2-year permit to conduct petroleum exploration in an 18,000-square-kilometer (6,950-square-mile) area in offshore Blocks "B" and "C" and an onshore part between Buchanan and the Sierra Leone border. Universal was expected to drill two wells in the next 18 months. Chevron Oil Co. and Frontier International Petroleum Co. re-

[12] Page 44 of work cited in footnote 3.

linquished rights to these areas in August 1973. Oxoco and MacClellen and Associates applied for an oil concession to explore for oil on Block "A." Crystal Oil Co. relinquished Block "D–1" because the basement was shallow and the drillable structures were located in deep waters. Aracca Petroleum Corp. completed a study and reinterpretation of seismic data on Block "D–2." Aracca plans to shoot additional lines in December 1974 to determine drilling targets. Merchants Petroleum in Los Angeles reported that it had purchased a 5% interest in acreage held by Aracca Petroleum in 1972. The Ashland-Amoco group relinquished its acreage in Liberia in August 1973.

# The Mineral Industry of Libya

By John L. Albright [1]

During 1974 the Libyan Government tightened its control on the petroleum industry, secured settlements with several foreign oil companies for nationalized facilities, marketed large volumes of crude oil, placed new emphasis on oil exploration by issuing production-sharing contracts to nine foreign companies, and developed plans for expansion of the country's petroleum refineries. Although Libya's oil prices were considered high by many potential customers and were pared somewhat during the year, numerous direct sales contracts were negotiated for the country's oil.

Libya's oil producers and exporters recorded a gradual decline in crude oil output and shipments during the year, attributable largely to an international slump in demand for petroleum and to the relatively high prices of Libyan oils. Despite the reduced production and shipments of oil during 1974, Libya's petroleum revenues reportedly escalated to $4.5 billion,[2] up 95% from 1973.[3] The Government's receipts from the oil exports averaged $8.25 per barrel in 1974, an increase of 184.7% over that of 1973.

A petrochemical complex based on natural gas will be built at Marsá al Burayqah. Ammonia and methanol plants being built there will begin operations in 1976 and 1977, respectively, and Libya may also build ethylene and urea plants at Marsá al Burayqah. The ethylene plant would be rated at 400,000 tons per year, and the urea facility would have a production capacity of 365,000 tons per year.

## PRODUCTION

Sales of liquefied natural gas (LNG) to European customers by Esso Standard Libya, Inc. (Esso), a subsidiary of Exxon Corp., were interrupted in October because of a price dispute; most of the company's gas output was in association with its crude oil production. The Government refused to allow Esso to flare its natural gas when the shipments fell off, and the company's crude oil and natural gas production was shut down for a period of 3 weeks until a new sales contract was signed and production activities resumed.

Crude oil production declined 30% during the year, attributable mainly to reduced demand and the relatively high costs of Libyan oil in world markets. Libya's crude oil output, which had averaged 2.2 million barrels per day during 1973, fell to 1.8 million barrels per day in June 1974, and declined further to average 1.5 million barrels per day for the year. Occidental of Libya, Inc., and Oasis Oil Co. of Libya, Inc., accounted for more than one-half of the total oil production.

[1] Mineral specialist, Division of Petroleum and Natural Gas.

[2] Where necessary, values have been converted from Libyan pounds (£L) to U.S. dollars at the rate of 1£L=US$3.38.

[3] Petroleum Economist. V. 42, No. 5, May 1975, p. 193.

Table 1.—Libya: Production of mineral commodities

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| NONMETALS | | | | |
| Cement, hydraulic | thousand metric tons | 61 | 79 | [e] 80 |
| Gypsum [e] | do | 4 | 4 | 4 |
| Salt [e] | do | [r] 11 | 11 | 11 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Gas, natural: | | | | |
| Gross production | million cubic feet | 496,075 | 562,900 | 425,349 |
| Marketed production | do | 275,453 | 385,246 | [2] 345,185 |
| Petroleum: | | | | |
| Crude | thousand 42-gallon barrels | 819,619 | 793,839 | 555,291 |
| Refinery products: | | | | |
| Gasoline | do | 606 | 511 | 618 |
| Kerosine and jet fuel | do | 374 | 516 | 345 |
| Distillate fuel oil | do | 717 | 840 | 760 |
| Residual fuel oil | do | 1,360 | 1,168 | 1,219 |
| Other | do | 103 | 172 | -- |
| Refinery fuel and losses | do | 158 | 42 | 51 |
| Total | do | 3,318 | 3,249 | 2,993 |

[e] Estimate. [p] Preliminary. [r] Revised.

[1] In addition to the commodities listed, construction materials such as sand, gravel, crushed stone, brick and tile are produced. but information is inadequate to make reliable estimates of output levels. Natural gas liquids are also produced, but are blended with crude oil and are reported as a part of that total.

[2] Includes gas injected to reservoirs for repressuring.

## TRADE

While significant quantities of metal and nonmetal commodities were imported, Libya's mineral trade was dominated by crude oil and natural gas exports. Crude oil exports totaled 544 million barrels in 1974, or 1.5 million barrels per day, off 31.5% from 1973. More than 65% of Libya's oil exports were from the Ras es-Sidr and Az Zuwaytinah tanker loading facilities, and the remaining oil exports were made from Marsá al Burayqah, Ras Lanuf, and Tobruk. Oil shipments to Europe accounted for 84.3% of the total, with 10.4% to the Western Hemisphere and 5.3% to other countries. Libyan crude oil shipments to the United States in 1974 totaled 0.5 million barrels, off 99.4% from the 74.9 million barrels shipped during 1973. While oil exports decreased considerably during the year to most European refineries, oil shipments to Brazil increased by 165.6%, to 24.7 million barrels. Those to Japan totaled 23.6 million barrels in 1974, an increase of 266% from that of 1973. The Libyan National Oil Corp. (LINOCO) was the country's largest exporter, with 247.4 million barrels of crude oil, and Occidental of Libya, Inc., was second largest with 54.9 million barrels.

## Table 2.—Libya: Crude oil exports by country
(Thousand 42-gallon barrels)

| Country | 1972 | 1973 | 1974 p |
|---|---|---|---|
| Austria | 4,658 | 4,524 | 4,052 |
| Bahamas | 41,417 | 31,784 | 13,834 |
| Belgium-Luxembourg | 9,432 | 19,896 | 10,841 |
| Brazil | 3,782 | 9,294 | 24,674 |
| Bulgaria | 4,230 | 6,006 | 1,944 |
| Canada | 12,921 | 12,598 | 3,030 |
| Denmark | 678 | 1,272 | 1,643 |
| Egypt | -- | 5,297 | 1,132 |
| France | 71,788 | 44,252 | 34,412 |
| Germany, West | 202,527 | 181,452 | 120,414 |
| Greece | 1,304 | 14,282 | NA |
| Italy | 159,440 | 206,579 | 183,522 |
| Japan | 2,406 | 6,445 | 23,579 |
| Liberia | -- | 196 | NA |
| Netherlands | 37,916 | 31,427 | 4,891 |
| Norway | 1,710 | 1,408 | NA |
| Romania | 6,020 | 9,491 | 1,460 |
| Spain | 20,620 | 11,996 | 20,002 |
| Sweden | 661 | 373 | NA |
| Switzerland | 13,482 | 11,865 | 7,629 |
| Trinidad and Tobago | 25,843 | 3,570 | -- |
| Turkey | -- | 187 | NA |
| United Kingdom | 111,031 | 90,935 | 66,759 |
| United States | 63,546 | 74,910 | 475 |
| U.S.S.R. | 13,855 | 12,906 | NA |
| Yugoslavia | -- | 742 | NA |
| Not specified | -- | -- | 19,667 |
| Total | 809,267 | 793,687 | 543,960 |

p Preliminary. NA Not available.

Source: Libya Department of Census and Statistics, External Trade Statistics 1972 and 1973 and Organization of the Petroleum Exporting Countries, Annual Statistical Bulletin, 1974. Figures for 1972 include partly refined oil.

## Table 3.—Libya: Exports and reexports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **EXPORTS** | | |
| METALS | | |
| Iron and steel, scrap | 175 | -- |
| Nonferrous metal scrap | 1,997 | 1,577 |
| NONMETALS | | |
| Sulfur and iron pyrites, unroasted | 100 | -- |
| Other crude minerals, n.e.s | 60 | 81 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Gas, natural, liquefied ---- million cubic feet [1] | 70,160 | 121,481 |
| Natural gas liquids (including those derived from oil refining) thousand 42-gallon barrels | 2,740 | 3,816 |
| Petroleum: | | |
| Crude ---- do | 808,118 | 793,687 |
| Partly refined ---- do | 1,149 | -- |
| Refinery products: | | |
| Gasoline ---- do | (2) | 1 |
| Kerosine ---- do | (2) | (2) |
| Distillate fuel oil ---- do | (2) | 1 |
| Residual fuel oil ---- do | 2,628 | 6,997 |
| Total ---- do | 2,628 | 6,999 |
| **REEXPORTS** | | |
| METALS | | |
| Iron and steel, semimanufactures, tubes, pipes, fittings | 128 | -- |
| NONMETALS | | |
| Cement | 1 | -- |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Petroleum refinery products: | | |
| Gasoline ---- thousand 42-gallon barrels | (2) | -- |
| Lubricants ---- do | (2) | 3 |
| Mineral jelly and waxes ---- do | -- | 6 |
| Total ---- do | (2) | 9 |

[1] Converted from British thermal units (Btu) at the rate of 1,000 Btu=1 cubic foot of gas.
[2] Less than ½ unit.

## Table 4.—Libya: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum metal including alloys, unwrought and semimanufactures | 4,390 | 6,455 | Italy 3,428; Greece 1,163. |
| Copper metal including alloys, unwrought and semimanufactures | 427 | 1,255 | Poland 530; Italy 276; Netherlands 148. |
| Iron and steel: | | | |
| Ore and concentrate | 8,990 | 1,205 | Mainly from Yugoslavia. |
| Metal: | | | |
| Pig iron, ferroalloys and similar materials | 5 | 2,161 | Mainly from Tunisia. |
| Steel, primary forms | 575 | 82 | Belgium-Luxembourg 71; Italy 11. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 59,364 | 118,453 | Italy 71,634; Belgium-Luxembourg 23,905. |
| Universals, plates, sheets | 31,092 | 48,878 | Italy 23,089; Belgium-Luxembourg 7,853; West Germany 4,960. |
| Hoop and strip | 4,356 | 6,466 | Mainly from Italy. |
| Rails and accessories | 1,981 | 202 | Mainly from Yugoslavia. |
| Wire | 147,741 | 269,103 | Italy 170,157; Belgium-Luxembourg 37,605. |
| Tubes, pipes, and fittings | 84,184 | 100,074 | Italy 28,106; West Germany 19,343; France 10,806. |
| Castings and forgings, rough | 64 | 117 | Mainly from Italy. |
| Lead metal including alloys, unwrought and semimanufactures | 1,780 | 2,594 | Tunisia 1,367; West Germany 812. |
| Nickel metal including alloys, unwrought and semimanufactures | 24 | 1 | Mainly from Tunisia. |
| Platinum-group metals and silver: | | | |
| Ore and concentrate | 1 | 1 | All from United Kingdom and Italy. |
| Metals including alloys: | | | |
| Platinum group troy ounces | 4,855 | -- | |
| Silver do | 265,565 | 276,914 | France 96,741; Italy 71,310; West Germany 59,222. |
| Tin metal, including alloys, unwrought and semimanufactures long tons | 45 | 46 | West Germany 23; United Kingdom 10; Sweden 6. |
| Zinc metal including alloys, unwrought and semimanufactures | 364 | 132 | Belgium-Luxembourg 105; Italy 14. |
| Other ores and concentrates of nonferrous base metals | 50 | 1,100 | Greece 800; Italy 300. |
| **NONMETALS** | | | |
| Abrasives: | | | |
| Crude, natural, including industrial diamond | 2,149 | 376 | Italy 346; Lebanon 24. |
| Grinding and polishing wheels and stones | 287 | 649 | Italy 589. |
| Asbestos | 1,913 | 2,077 | Botswana 1,760; U.S.S.R. 287. |
| Barite and witherite | (1) | 7 | All from West Germany. |
| Cement thousand tons | 1,354 | 1,803 | Egypt 310; Italy 308; U.S.S.R. 216. |
| Chalk | 136 | 134 | United Kingdom 130. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s | 14,676 | 7,763 | Greece 4,203; Italy 3,400. |
| Products | 155,393 | 136,584 | Italy 70,796; Tunisia 47,855. |
| Fertilizer materials: | | | |
| Crude | 498 | 2 | All from Lebanon. |
| Manufactured: | | | |
| Nitrogenous | 20,216 | 70,052 | Yugoslavia 40,167; Italy 9,408. |
| Phosphatic | 1,040 | -- | |
| Potassic | 200 | -- | |
| Other | 9,093 | 9,946 | Italy 5,345; Lebanon 2,425; Yugoslavia 1,660. |
| Graphite, natural | -- | 3 | All from West Germany. |
| Gypsum and plasters | 1,048 | 3,877 | Lebanon 1,431; Tunisia 1,355; Italy 607. |
| Lime | 121,603 | 187,769 | Italy 66,108; Lebanon 60,317; Greece 25,265. |
| Magnesite | 34 | -- | |
| Mica, all forms | 2 | 244 | Romania 227; Yugoslavia 17. |
| Pigments, mineral, natural crude | 6,844 | 3,274 | Turkey 1,800; Italy 764. |
| Salt | 30 | 20 | All from Tunisia. |

See footnote at end of table.

Table 4.—Libya: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 18,939 | 31,539 | Italy 26,875; Greece 3,362. |
| Worked | 8,526 | 13,464 | Mainly from Italy. |
| Gravel and crushed rock | 86,149 | 115,233 | Italy 92,997; Greece 12,183. |
| Dolomite | -- | 1 | All from Italy. |
| Limestone (except dimension) | 311 | 1,050 | Mainly from Turkey. |
| Sand, excluding metal bearing | 3,008 | 1,580 | Greece 1,200; Italy 359. |
| Sulfur and iron pyrites, unroasted | 58 | -- | |
| Other: | | | |
| Crude | 290 | 242 | Yugoslavia 202; Italy 40. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 1,461 | 27,484 | Italy 5,246; Yugoslavia 4,193; Greece 4,058. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 6,799 | 9,749 | Italy 8,340; Syria 1,200. |
| Coal and coke, including briquets | 542 | 504 | Italy 399; United States 65. |
| Petroleum, refinery products: | | | |
| Gasoline thousand 42-gallon barrels | 2,082 | 2,615 | All from Italy. |
| Kerosine do | 512 | 440 | Do. |
| Distillate fuel oil do | 2,274 | 3,070 | Do. |
| Residual fuel oil do | 83 | 241 | Do. |
| Lubricants do | 141 | 193 | Netherlands 106; Tunisia 44; United Kingdom 26. |
| Other: | | | |
| Liquefied petroleum gas do | 5 | 73 | Mainly from Italy. |
| Mineral jelly and wax do | 1 | (1) | |
| Miscellaneous products do | 591 | 695 | Italy 620; Albania 70. |
| Total do | 5,689 | 7,327 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 13 | 20 | Italy 19. |

[1] Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Libya signed an agreement with Guinea under which the two countries would develop bauxite reserves in Guinea. In 1974 Libya held discussions with Brazil, which included the construction of an aluminum facility in Libya.

### NONMETALS

**Cement.**—In an effort to reduce the country's growing dependence on foreign supplies of building materials, Libya during 1974 expanded its cement production capacity and developed plans to construct several new facilities. In 1974 a new plant began production at al Imgariaf with a yearly capacity of 365,000 tons. The yearly capacity of the al Khums cement plant was being expanded to 500,000 tons, after reaching 430,000 tons per year during 1973. Plans were finalized to construct a 1-million-ton-per-year cement plant at Souk el Khamis, in northwest Libya in the Tarabulus area. This $109 million plant will be built by two West German firms and placed in service in 1976. Plans were studied for the construction of a 525,000-ton-per-year plant to be built on the northeastern coast between Banghazi and Tobruk.

### MINERAL FUELS

**Natural Gas.**—The Libyan Methanol National Corp., a jointly owned venture of LINOCO and the Occidental Petroleum Corp., awarded a contract to Friedrich Uhde GmbH of West Germany to build a 1,000-ton-per-day-capacity methanol plant at Marsá al Burayqah. During the year construction began on the new plant, which was scheduled to be completed during 1977. It will cost approximately $88 million. Natural gas feedstocks will be processed at a rate of 50 million cubic feet per day. A contract was also awarded to Uhde for the construction of a 1,000-ton-per-day ammonia plant near the methanol

production facility; the ammonia plant will be completed in 1976, according to the terms of the contract.

Early in 1974 Occidental was planning a feasibility study for a $500 million natural gas processing plant in Libya, but abandoned the study later in the year. Occidental's management reportedly decided that it would be more profitable to reinject the gas to increase crude oil production from the firm's North African oil wells.

Libya's gross production of natural gas totaled 425 billion cubic feet in 1974, of which 345 billion cubic feet (81.2%) was consumed by the producing companies or marketed, and the remainder was flared.

**Petroleum.**—In February 1974 Libya announced the total nationalization of two U.S. oil companies operating in the country, American Overseas Petroleum, Ltd., (Amoseas), owned 50% by California Asiatic Oil Co. (an affiliate of Standard Oil Co. of California) and 50% by Texaco Overseas Petroleum Co., and the Libyan American Oil Co. (a subsidiary of Atlantic Richfield Corp.).[4] Mobil Oil Corp. and Exxon Corp. signed agreements with Libya in April 1974, each relinquishing 51% of their crude oil production operations to Libya. The agreements did not affect Esso's liquefied natural gas plant at Marsá al Burayqah.[5] Shell Exploratie en Productie Maatschappij (Libya) N.V. accepted Libya's 100% nationalization of its interest in the Oasis Oil group's Libyan concession and dropped all legal actions against the Government.[6] Libya nationalized the Shell operations after the company had rejected the Government's 51% nationalization order of 1973. Under the agreement, Shell will receive Libyan crude oil in compensation for its nationalized assets.

In November Libya reached final settlement with BP Exploration Company (Libya) Ltd., for all outstanding issues arising from the Government's December 1971 takeover of the BP concession in Libya. BP and the Nelson Bunker Hunt Petroleum Co. had jointly developed the Sarir oilfield.[7]

Libya encountered difficulties marketing its crude oil at January's $16 to $20 per barrel prices and reduced its contract prices to $14.50 to $14.80 per barrel, effective April 1, and further to $12.75 to $13.30, effective May 1.[8] Libya lowered its fourth-quarter 1974 contract prices for sales of government crude oil by about $0.80 per barrel, and the new contract prices averaged about $12.25 for the various grades of Libyan crudes.

During 1974 Libya signed seven production-sharing agreements with nine foreign oil companies, under which the companies will carry out offshore and onshore exploration over the next 4 to 6 years. According to the signed contracts, oil companies from Brazil, France, Italy, the United States, and West Germany will invest more than $500 million in searching for oil in Libya, and in all cases Libya will receive the major share of oil produced under these agreements.

Azienda Generale Italiana Pétroli S.p.A. (AGIP), a subsidiary of the Italian State oil concern Ente Nazionale Idrocarburi (ENI), signed an agreement covering one offshore and three onshore areas totaling nearly 144,000 square kilometers.[9] Production will be shared 85% to 15% from the onshore and 81% to 19% from the offshore areas.

Brazil's state-owned Petrobrás Internacional S.A. (Braspetro) signed an agreement with Libya under which the Brazilians will invest $35 million in two onshore areas in the Murzuk and Sirte Basins totaling 20,000 square kilometers. Libya will claim 85% of any commercial quantities of oil produced and Braspetro 15%.[10]

Esso Standard Libya, Inc., will invest $90 million in several offshore and onshore areas totaling 98,000 square kilometers, according to an agreement signed with LINOCO late in September. The onshore area covered 15,000 square kilometers and two offshore tracts covered 83,000 square kilometers.

During 1974 two production-sharing contracts were signed with several French companies. Cie. Française des Pétroles

[4] Oil and Gas Journal. Libya Takes Over Socal, Texaco, ARCO Holdings. V. 72, No. 7, Feb. 18, 1974, p. 36.

[5] Middle East Economic Survey (Beirut, Lebanon). Mobil and Exxon Accept Libya's 51 Percent Nationalization and Acquire New Acreage Production-Sharing Terms. V. 17, No. 26, Apr. 19, 1974, pp. 4 and 5.

[6] Middle East Economic Survey (Beirut, Lebanon). Shell Accepts Libya's 100 Percent Nationalization. V. 17, No. 34, June 14, 1974, p. 3.

[7] Journal of Commerce. BP and Libya Settle Claims From Nationalization. V. 322, No. 32,333, Nov. 26, 1974, p. 5.

[8] World Oil. A World of Oil. V. 178, No. 7, June 1974, p. 18.

[9] World Oil. A World of Oil. V. 178, No. 5, April 1974, p. 24.

[10] Oil and Gas Journal. International Briefs. V. 72, No. 38, Sept. 23, 1974, p. 122.

(CFP) will spend $90 million exploring for oil in Libya in an area of approximately 100,000 square kilometers, of which about one-half is onshore near the Tunisian border and the remaining area is offshore Eastern Libya in the Mediterranean Sea. Production will be shared 81% to 19% in LINOCO's favor offshore and 85% to 15% onshore.[11] Essence et Lubrificiant de France (Elf) and Société Nationale des Pétroles d'Aquitaine (SNPA) signed an agreement with Libya for offshore and onshore exploration areas. The companies agreed to invest $45 million over a period of 4 years. In the event of commercial oil production, Libya will own 81% of the offshore and 85% of the onshore output.

Mobil and West Germany's Gelsenberg AG negotiated a production-sharing contract involving 6.75 million acres in seven onshore and two offshore areas. Production will be divided between the oil companies and Libya by the same percentages as in the AGIP-Libyan agreement. Mobil (75% interest in the venture) and Gelsenberg (25% interest) will spend a combined $70 million in their search for oil in Libya.

Occidental negotiated a production-sharing contract with LINOCO on 19 blocks covering about 45,000 square kilometers onshore. According to the terms of the agreement, LINOCO and Occidental will share all production from the area on a 81% to 19% basis. Production costs will be shared on the same basis. Most of the blocks are in the Sirte Basin, and some cover concessions previously relinquished by other companies.[12]

Both Mobil and Occidental reported oil discoveries in 1974. Mobil's A–1 well in Concession 13 tested 1,718 barrels per day of 34° gravity crude oil from a ¾-inch choke. The producing zone was at 2,575 meters. Occidental's well flowed 2,260 barrels per day of 48.6° gravity crude oil from about 2,900 meters through a 1-inch choke.

Oilfield drilling activity declined somewhat in 1974, when a total of 72 wells was drilled, compared with 82 wells during 1973. A total of 150,248 meters was drilled in 1974, off 4.3% from that of 1973. In 1974 oil production wells drilled totaled 46; 1 natural gas, 3 dry, and 22 other wells were also drilled. Crude oil producing wells totaled 599 during the year, of which 226 were flowing, 252 pumping, and 121 were assisted by gas injection.[13]

LINOCO took delivery of three oil tankers from foreign manufacturers in 1974, one from Japan and two from Spain. In June a Japanese shipyard completed the 86,000-deadweight-ton *Ras Lanuf* and delivered it to Libya; the ship had been ordered in 1972. LINOCO had also placed orders with Spain in 1972 for the construction of two 47,000-deadweight-ton oil tankers. Spanish shipyards finished constructing these two vessels, the *Hariga* and the *Sarir*, and delivered them to LINOCO during the first half of 1974.

Domestic consumption of petroleum products averaged 37,500 barrels per day in 1974, an 84% increase from the country's 1971 average daily consumption of 20,400 barrels.[14] Libya's petroleum refining capacity will be expanded to better serve domestic and foreign markets. An Italian construction firm completed building the $110 million petroleum refinery at Az Zawiyah, on Libya's west coast near Tarabulus, and the plant began commercial operations in the third quarter of the year at the initial rate of 40,000 barrels per day. The refinery's capacity will be increased to 60,000 barrels per day in 1975 and then doubled to 120,000 barrels per day under a $54 million contract which was awarded to the same Italian firm that built the original plant.

Contracts were also awarded to an Italian firm for the construction of an export petroleum refinery at Tobruk, to be onstream in 1978. The throughput capacity of the refinery has been raised to 220,000 barrels per day from the original plan of 130,000 barrels per day.

Preliminary discussions were held by Libya and Cyprus concerning the construction of a jointly-owned petroleum refinery on Cyprus. The proposal called for a 50,000-barrel-per-day plant which would market the plant's output in Cyprus and in Europe. Libya approved a project to share with Yugoslavia in the construction of a $300 million petroleum refinery at Koper, on the Adriatic coast. The project called for the plant to have a throughput capacity of 160,000 barrels per day.

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[11] Oil and Gas Journal. International Briefs. V. 72, No. 22, June 3, 1974, p. 26.
[12] Oil and Gas Journal. Oxy, Libya Sign Exploration Deal. V. 72, No. 7, Feb. 18, 1974, p. 39.
[13] Arab Oil and Gas. 599 Producing Wells in 1974. V. 4, No. 36, Apr. 16, 1975, p. 19.
[14] Arab Oil and Gas. 1974 Consumption of Oil Products Reached 1,795,000 Tons. V. 4, No. 36, Apr. 16, 1975, p. 19.

# The Mineral Industry of Malaysia

By Keith L. Harris [1]

The Malaysian economy continued to grow in 1974 with the real gross national product (GNP) increasing by 6.3%. The export sector only increased 30%, compared with a 52% growth in 1973. A slumping demand in the second half of 1974 for timber and rubber, in reaction to the recession in industrial countries, lessened exports. Without the spectacular price increases for tin and petroleum, the value of exports would have been far lower. Imports increased 60%, primarily under inflationary pressures, causing the trade surplus to decline to $75 million [2] compared with $614 million in 1973.

The mineral industry provided 6% of the gross domestic product (GDP), up 1% over 1973, although the real growth of the mineral industry declined 9% because of reduced output.

Even with production down 6%, Malaysia continued to lead the world in tin output. At 67,048 long tons, Malaysian tin mine output was more than twice the output of the next largest tin producing country.

Until 1974, all of Malaysia's petroleum production came from Sarawak. However, in late 1974, the Exxon Oil Co. (Exxon) began production offshore Sabah. Although Exxon's initial output of only about 3,000 to 5,000 barrels per day was insufficient to stem declining production in Sarawak during 1974, the new field will have a capacity of 100,000 barrels per day after installation of a new production platform.

The Petroleum Development Act of 1974, enacted by the Malaysian Government in August, established a national oil company and vested in it the ownership of all Malaysian petroleum. Petroleum Nasional Berhad (Petronas) will control the exploration and exploitation of petroleum and all downstream operations such as refining and petrochemical manufacture.

The Malaysian Government announced a goal of at least 30% indigenous holdings in commercial and industrial firms by 1990. To achieve that goal, guidelines applying to any acquisitions by foreign interests of fixed assets in Malaysia were established.

## PRODUCTION

The production of all of Malaysia's major minerals declined substantially in 1974. Tin production declined 6% from 1973 owing to higher mining costs and depletion of tin deposits. Crude petroleum production declined 11% owing to technical difficulties at Sarawak's major oilfield, West Lutong. Bauxite and iron ore production declined 17% and 7%, respectively.

[1] Physical scientist, Division of Nonferrous Metals.
[2] Where necessary, values have been converted from Malaysian dollars (M$) to U.S. dollars at the rate of M$2.40=US$1.00.

## Table 1.—Malaysia: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity [2] | 1972 | 1973 | 1974 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum, bauxite, gross weight ---- thousand tons -- | 1,076 | 1,143 | 947 |
| Antimony, mine output, metal content (Sarawak) ---- | 205 | 250 | 254 |
| Columbium and tantalum concentrates, gross weight ---- | 89 | 74 | 158 |
| Copper, mine output, metal content [e 3] ---- | 60 | 50 | 40 |
| Gold, mine output, metal content: | | | |
| West Malaysia ---- troy ounces -- | r 3,780 | 2,730 | 3,495 |
| Sarawak ---- do ---- | 1,653 | 989 | 848 |
| Total ---- do ---- | r 5,433 | 3,719 | 4,343 |
| Iron and steel: | | | |
| Iron ore and concentrate ---- thousand tons -- | r 521 | 517 | 481 |
| Pig iron and ferroalloys ---- do ---- | 80 | 100 | 110 |
| Crude steel [e] ---- do ---- | 80 | 100 | 110 |
| Manganese ore and concentrate, gross weight ---- | 33,528 | 28,346 | 85,262 |
| Rare-earth minerals: [4] | | | |
| Monazite, gross weight ---- | 1,748 | 2,539 | 1,694 |
| Xenotime (yttrium mineral), gross weight ---- | 40 | e 114 | 102 |
| Tin: | | | |
| Mine output, metal content ---- long tons -- | 75,617 | 71,119 | 67,048 |
| Smelter output [5] ---- do ---- | 88,004 | 80,249 | 85,748 |
| Titanium, ilmenite concentrate, gross weight [4] ---- | 152,174 | 185,414 | 149,261 |
| Tungsten, mine output metal content ---- | 5 | 121 | 127 |
| Zirconium, zircon concentrate, gross weight [4] ---- | 1,651 | e 3,142 | 2,753 |
| **NONMETALS** | | | |
| Cement, hydraulic ---- thousand tons -- | 1,160 | 1,278 | 1,362 |
| Clays, kaolin ---- | 104,978 | 106,009 | 146,374 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Gas, natural (Sarawak): | | | |
| Gross production [e] ---- million cubic feet -- | 35,000 | 35,000 | 31,000 |
| Marketed production ---- do ---- | 3,325 | 3,187 | e 2,800 |
| Petroleum: | | | |
| Crude (Sarawak) ---- thousand 42-gallon barrels -- | r 33,867 | 33,080 | 29,324 |
| Refinery products: | | | |
| Gasoline: | | | |
| Sarawak ---- do ---- | 7,491 | 5,272 | 438 |
| West Malaysia ---- do ---- | 3,016 | 3,322 | 3,614 |
| Jet fuel: | | | |
| Sarawak [4] ---- do ---- | 5,772 | 2,498 | -- |
| West Malaysia ---- do ---- | -- | 4,811 | 657 |
| Kerosine: | | | |
| Sarawak ---- do ---- | 1,605 | -- | 1,606 |
| West Malaysia ---- do ---- | 1,613 | 2,051 | 547 |
| Distillate fuel oil: | | | |
| Sarawak ---- do ---- | 1,967 | 1,928 | 365 |
| West Malaysia ---- do ---- | 4,502 | 6,461 | 5,986 |
| Residual fuel oil: | | | |
| Sarawak ---- do ---- | 7,459 | 5,289 | -- |
| West Malaysia ---- do ---- | 8,313 | 8,943 | 9,929 |
| Lubricants: | | | |
| Sarawak ---- do ---- | -- | -- | -- |
| West Malaysia ---- do ---- | 344 | -- | -- |
| Other: | | | |
| Sarawak ---- do ---- | 414 | 226 | -- |
| West Malaysia ---- do ---- | 7,347 | 9,381 | 8,724 |
| Refinery fuel and losses: | | | |
| Sarawak ---- do ---- | -- | 803 | 475 |
| West Malaysia ---- do ---- | 650 | 2,083 | 1,020 |
| Total: | | | |
| Sarawak ---- do ---- | 24,708 | 16,016 | 2,884 |
| West Malaysia ---- do ---- | 25,785 | 37,052 | 30,477 |
| Grand total ---- do ---- | 50,493 | 53,068 | 33,361 |

e Estimate. r Revised. p Preliminary. NA Not available.

[1] All production is from West Malaysia unless otherwise indicated in commodity table.

[2] In addition to the commodities listed, a variety of crude construction materials (clays, sand, gravel and stone), salt and fertilizer is produced, but production is not reported and available information is inadequate for the formulation of reliable estimates of output levels.

[3] Estimates based on exports of copper concentrates.

[4] Based on export figures.

[5] Includes concentrates imported for refining and reexport. These imports yielded 11,743 long tons of metal in 1972.

## TRADE

Tin, second only to rubber as a major foreign exchange earner, was the leading export among mineral commodities. A 5% increase in the volume of tin exports and a spectacular 66% rise in the average value combined to give tin more than 15% of the total export value in 1974. The United States (29%) and Japan (22%) were the major recipients of Malaysian tin.

The volume of petroleum exports decreased because of production difficulties but the value of exports increased 176% to $315 million, or about 8% of the total export value.

**Table 2.—Malaysia: Exports and reexports of mineral commodities [1]**
(Metric tons unless otherwise specified)

| Commodity | 1972 | | | | 1973 | | | |
|---|---|---|---|---|---|---|---|---|
| | Sabah | Sarawak | West Malaysia | Total | Sabah | Sarawak | West Malaysia | Total |
| **METALS** | | | | | | | | |
| Aluminum: | | | | | | | | |
| Bauxite | -- | -- | 987,377 | 987,377 | -- | -- | 1,018,957 | 1,018,957 |
| Alumina | -- | -- | 1 | 1 | -- | -- | 1 | 1 |
| Metal including alloys: | | | | | | | | |
| Scrap | 5 | 32 | 628 | 665 | 27 | 35 | 485 | 547 |
| Unwrought | -- | -- | 84 | 84 | -- | -- | 177 | 177 |
| Semimanufactures | 1 | (2) | r 1,378 | 1,379 | 1 | (2) | 1,594 | 1,595 |
| Columbite ore | -- | -- | r 69 | 69 | -- | -- | 69 | 69 |
| Copper: | | | | | | | | |
| Ore | -- | -- | 250 | 250 | -- | -- | (2) | (2) |
| Metal: | | | | | | | | |
| Scrap | 98 | 98 | 844 | 1,040 | 137 | 114 | 1,128 | 1,379 |
| Unwrought and semimanufactures | 2 | (2) | r 655 | 657 | (2) | (2) | 763 | 763 |
| Iron and steel: | | | | | | | | |
| Iron ore - thousand tons | -- | -- | 371 | 371 | -- | -- | 224 | 224 |
| Metal: | | | | | | | | |
| Scrap | 920 | 1,330 | 2,528 | 4,778 | 3,901 | 1,238 | 842 | 5,981 |
| Pig iron, ferroalloys and similar materials | -- | -- | 19 | 19 | (2) | -- | 117 | 117 |
| Steel, primary forms | 43 | (2) | 374 | 417 | -- | 2 | 1,772 | 1,774 |
| Semimanufactures: | | | | | | | | |
| Bars, rods angles, shapes, sections | 2 | 3 | 54,863 | 54,868 | 25 | 44 | 34,407 | 34,476 |
| Universals, plates, sheets | 18 | (2) | 9,483 | 9,501 | 61 | 14 | 11,449 | 11,524 |
| Hoop and strip | (2) | 7 | 373 | 380 | -- | -- | 413 | 413 |
| Rails and accessories | 564 | 1,766 | 1,446 | 3,776 | 435 | 196 | 797 | 1,428 |
| Wire | -- | 6 | 2,443 | 2,449 | (2) | 12 | 4,168 | 4,180 |
| Tubes, pipes, fittings | 134 | 609 | 7,375 | 8,118 | 64 | 217 | 8,440 | 8,721 |
| Castings and forgings, rough | 32 | 5 | 312 | 349 | 168 | (2) | 206 | 374 |
| Lead: | | | | | | | | |
| Oxide | -- | -- | 65 | 65 | -- | -- | 25 | 25 |
| Metal including alloys, all forms | 86 | 72 | 177 | 335 | 45 | 33 | 193 | 271 |
| Ore and concentrate, gross weight | -- | -- | 5 | 5 | -- | -- | -- | -- |
| Magnesium metal including alloys, all forms | -- | -- | (2) | (2) | -- | -- | -- | -- |
| Manganese ore | -- | -- | 33,530 | 33,530 | -- | -- | 62,574 | 62,574 |
| Mercury - 76-pound flasks | -- | -- | 3 | 3 | -- | -- | 1 | 1 |
| Monazite | -- | -- | 1,830 | 1,830 | -- | -- | 2,541 | 2,541 |
| Nickel metal including alloys, all forms | 10,790 | -- | (2) | 10,790 | -- | -- | 1,290 | 1,290 |
| Platinum-group metals: | | | | | | | | |
| Platinum group troy ounces | -- | -- | 44 | 44 | -- | -- | 29 | 29 |
| Silver do | -- | -- | 146 | 146 | -- | -- | 3,077 | 3,077 |
| Thorium ore | -- | -- | 61 | 61 | -- | -- | 125 | 125 |

See footnotes at end of table.

Table 2.—Malaysia: Exports and reexports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | | | | 1973 | | | |
|---|---|---|---|---|---|---|---|---|
| | Sabah | Sarawak | West Malaysia | Total | Sabah | Sarawak | West Malaysia | Total |
| METALS—Continued | | | | | | | | |
| Tin: | | | | | | | | |
| Ore ____ long tons | -- | -- | (2) | (2) | -- | -- | -- | -- |
| Metal including alloys: | | | | | | | | |
| Scrap ____ do | -- | -- | 8 | 8 | -- | -- | 18 | 18 |
| Residues (slag and hardhead) do | -- | -- | 8,146 | 8,146 | -- | -- | 11,202 | 11,202 |
| Unwrought do | -- | -- | 88,601 | 88,601 | -- | (2) | 80,256 | 80,256 |
| Semimanufactures do | -- | -- | 3 | 3 | -- | -- | 1 | 1 |
| Titanium ore and concentrate: | | | | | | | | |
| Ilmenite | -- | -- | 154,320 | 154,320 | -- | -- | 185,414 | 185,414 |
| Other | -- | -- | -- | -- | -- | -- | 241 | 241 |
| Tungsten ore and concentrate | -- | -- | 347 | 347 | -- | -- | 337 | 337 |
| Zinc metal including alloys: | | | | | | | | |
| Scrap | -- | -- | 298 | 298 | -- | -- | 180 | 180 |
| Blue powder | -- | -- | 1 | 1 | -- | -- | 18 | 18 |
| Unwrought | -- | -- | 4 | 4 | -- | -- | 19 | 19 |
| Semimanufactures | -- | 5 | 73 | 78 | 3 | (2) | 35 | 38 |
| Zircon | -- | -- | 2,722 | 2,722 | -- | -- | 3,142 | 3,142 |
| Other: | | | | | | | | |
| Ores and concentrates | -- | 627 | 26 | 653 | -- | 777 | 10 | 787 |
| Ash and residue containing nonferrous metals | -- | -- | 1,074 | 1,074 | -- | -- | 512 | 512 |
| Oxides, hydroxides, peroxides of metals, n.e.s | -- | -- | 121 | 121 | -- | -- | 394 | 394 |
| Metals including alloys all forms | -- | -- | (2) | (2) | -- | -- | 7 | 7 |
| NONMETALS | | | | | | | | |
| Abrasives, natural, n.e.s.: | | | | | | | | |
| Pumice, emery, natural corundum, etc | -- | -- | 35 | 35 | -- | -- | 18 | 18 |
| Grinding and polishing wheels and stones | (2) | (2) | 41 | 41 | (2) | -- | 47 | 47 |
| Dust and powder of precious or semiprecious stones ____ value | -- | -- | $167 | $167 | -- | -- | -- | -- |
| Asbestos | -- | -- | 13 | 13 | -- | -- | 4 | 4 |
| Barite and witherite | 6,037 | -- | 3 | 6,040 | 1,147 | 8 | 7 | 1,162 |
| Boron materials, crude | -- | -- | 2 | 2 | -- | -- | 23 | 23 |
| Cement | 34 | 55 | 177,572 | 177,661 | 49 | 34 | 97,324 | 94,407 |
| Chalk | -- | -- | 17 | 17 | -- | -- | 5 | 5 |
| Clays and clay products (including all refractory brick): | | | | | | | | |
| Crude: | | | | | | | | |
| Kaolin | -- | (2) | 5,187 | 5,187 | -- | -- | 9,848 | 9,848 |
| Bentonite | 79 | -- | 3 | 82 | -- | -- | (2) | (2) |
| Fuller's earth | -- | -- | 18 | 18 | -- | -- | 149 | 149 |
| Other clays | -- | -- | 3,458 | 3,458 | -- | (2) | 4,583 | 4,583 |
| Products: | | | | | | | | |
| Refractory | 78 | -- | 228 | 306 | -- | 5 | 396 | 401 |
| Nonrefractory | (2) | 60 | 8,154 | 8,214 | -- | 128 | 7,693 | 7,821 |
| Diamond, gem, not set or strung ____ value | -- | -- | $332,883 | $332,883 | -- | -- | $148,279 | $148,279 |
| Diatomite and other infusorial earth | -- | -- | 1 | 1 | -- | -- | 8 | 8 |
| Feldspar, fluorspar, etc | -- | -- | 1,870 | 1,870 | -- | -- | 39 | 39 |
| Fertilizer materials: | | | | | | | | |
| Crude, phosphatic | -- | -- | 2,868 | 2,868 | -- | -- | 3,484 | 3,484 |
| Manufactured: | | | | | | | | |
| Nitrogenous | -- | -- | 477 | 477 | -- | -- | 2,470 | 2,470 |
| Phosphatic | -- | -- | 158 | 158 | -- | -- | 97 | 97 |
| Potassic | -- | -- | 79 | 79 | -- | 2 | 16 | 18 |
| Other, including mixed | -- | 3 | 34,890 | 34,893 | -- | 4 | 31,916 | 31,920 |
| Graphite | -- | -- | 2 | 2 | -- | -- | 1 | 1 |
| Gypsum and plasters | -- | -- | 53 | 53 | -- | (2) | 160 | 160 |
| Lime | -- | 5 | 5,545 | 5,550 | -- | 1 | 5,223 | 5,224 |
| Mica, including splittings and waste | -- | -- | (2) | (2) | -- | -- | (2) | (2) |
| Oxides and hydroxides of strontium, barium, etc | -- | -- | 12 | 12 | -- | -- | 332 | 332 |

See footnotes at end of table.

Table 2.—Malaysia: Exports and reexports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | | | | 1973 | | | |
|---|---|---|---|---|---|---|---|---|
| | Sabah | Sarawak | West Malaysia | Total | Samah | Sarawak | West Malaysia | Total |
| NONMETALS—Continued | | | | | | | | |
| Pigments, mineral, natural crude | — | — | 17 | 17 | — | (2) | 9 | 9 |
| Precious and semiprecious stones except diamond, natural value | — | $674 | $40,988 | $41,662 | $4,277 | — | $7,089 | $11,366 |
| Salt and brine | 604 | 1 | 269 | 874 | 561 | (2) | 313 | 874 |
| Sodium and potassium compounds, n.e.s.: | | | | | | | | |
| Caustic soda | — | — | 170 | 170 | 18 | — | 182 | 200 |
| Caustic potash, sodic and potassic peroxides | — | — | 8 | 8 | — | — | 8 | 8 |
| Stone, sand and gravel: | | | | | | | | |
| Dimension stone: | | | | | | | | |
| Crude and partly worked | — | 82 | 403 | 485 | — | (2) | 822 | 822 |
| Worked | — | (2) | 280 | 280 | — | — | 720 | 720 |
| Dolomite, chiefly refractory grade | — | — | 2,915 | 2,915 | — | — | 4,408 | 4,408 |
| Gravel and crushed rock | 1,951 | 35,556 | 519,035 | 556,542 | 102 | 30,228 | 721,512 | 751,842 |
| Limestone (except dimension) | — | — | 19,087 | 19,087 | — | — | 42,742 | 42,742 |
| Quartz and quartzite | — | — | 218 | 218 | — | — | 414 | 414 |
| Sand excluding metal bearing | 323 | 432 | 34,067 | 34,822 | — | 1,712 | 23,528 | 25,240 |
| Sulfur: | | | | | | | | |
| Sulfuric acid | (2) | (2) | 136 | 136 | (2) | — | 71 | 71 |
| Elemental | — | 10 | 66 | 76 | — | — | 139 | 139 |
| Talc, steatite, soapstone, pyrophyllite | (2) | — | 246 | 246 | — | — | 410 | 410 |
| Other nonmetals, n.e.s.: | | | | | | | | |
| Crude | — | (2) | 547 | 547 | — | — | 268 | 268 |
| Slag, dross and similar waste, not metal bearing | — | — | 2 | 2 | — | — | 1 | 1 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | | | |
| Asphalt and bitumen, natural | — | 4 | 14 | 18 | (2) | (2) | 2,848 | 2,848 |
| Carbon black and gas carbon | — | — | 51 | 51 | — | — | 28 | 28 |
| Coal and coal briquets | | | | | — | — | 38 | 38 |
| Coke and semicoke | — | — | 110 | 110 | — | — | 158 | 158 |
| Hydrogen, helium, rare gases | (2) | — | (3) | NA | (2) | — | (3) | NA |
| Petroleum: | | | | | | | | |
| Crude — thousand 42-gallon barrels | — | 26,393 | — | 26,393 | — | 25,823 | 64 | 25,887 |
| Partly refined — do | — | 8,461 | 1,228 | 9,689 | — | 7,430 | 215 | 7,645 |
| Refinery products: | | | | | | | | |
| Gasoline — do | 128 | 948 | 307 | 1,373 | 137 | 461 | 313 | 911 |
| Jet fuel — do | 43 | 1 | 36 | 80 | 64 | 1 | 35 | 100 |
| Kerosine — do | 6 | 1,482 | 222 | 1,710 | 3 | 2,405 | 257 | 2,665 |
| Distillate fuel oil — do | 46 | 1,992 | 460 | 2,498 | 15 | 1,610 | 610 | 2,235 |
| Residual fuel oil — do | 1 | — | (2) | 1 | 1 | (2) | 41 | 42 |
| Lubricants — do | 8 | (2) | 151 | 154 | 1 | (2) | 215 | 216 |
| Other: | | | | | | | | |
| Mineral jelly and wax — do | (2) | — | 99 | 99 | (2) | 2 | 352 | 354 |
| Nonlubricating oils, n.e.s. — do | (2) | — | 17 | 17 | (2) | — | 12 | 12 |
| Bitumen and bitumenous mixtures, n.e.s. — do | (2) | (2) | 42 | 42 | (2) | (2) | 22 | 22 |
| LPG — do | (2) | (4) | (5) | NA | (2) | (4) | (5) | NA |
| Unspecified — do | — | 6,645 | (2) | 6,645 | — | 4,504 | 2 | 4,506 |
| Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals | 1 | — | 67 | 68 | — | 9 | 6,833 | 6,842 |

r Revised.
[1] Figures for each region include exports to each of the other regions of Malaysia.
[2] Less than ½ unit.
[3] Value only reported at US$19,492 in 1972 and US$8,408 in 1973.
[4] Value only reported at US$329,471 in 1972 and US$119,677 in 1973.
[5] Value only reported at US$719 in 1972 and US$1,484 in 1973.

## Table 3.—Malaysia: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | | | | 1973 | | | |
|---|---|---|---|---|---|---|---|---|
| | Sabah | Sarawak | West Malaysia | Total [2] | Sabah | Sarawak | West Malaysia | Total [2] |
| **METALS** | | | | | | | | |
| Aluminum: | | | | | | | | |
| Bauxite | -- | -- | 300 | 300 | -- | -- | 300 | 300 |
| Oxide and hydroxide | (3) | (3) | 2,873 | 2,873 | -- | (3) | 4,447 | 4,447 |
| Metal including alloys all forms | 185 | 704 | r 9,726 | 10,615 | 196 | 262 | 11,707 | 13,965 |
| Antimony, metal | (3) | -- | 28 | 28 | (3) | 1 | 17 | 18 |
| Arsenic, sulfide, natural | -- | -- | 1 | 1 | -- | -- | -- | -- |
| Chrome, oxide and hydroxide | (3) | 1 | 49 | 50 | (3) | (3) | 76 | 76 |
| Cobalt, oxide and hydroxide | (3) | (3) | 15 | 15 | -- | -- | 1 | 1 |
| Copper: | | | | | | | | |
| Ore and concentrate | (3) | (3) | 18 | 18 | (3) | (3) | 14 | 14 |
| Metal including alloys, all forms | 84 | 64 | r 4,563 | 4,711 | 278 | 101 | 5,882 | 6,261 |
| Iron and steel: | | | | | | | | |
| Ore and concentrate | -- | (3) | 5 | 5 | -- | (3) | 13,766 | 13,766 |
| Iron and steel scrap | 3 | 186 | 15,597 | 15,786 | 47 | 198 | 4,685 | 4,930 |
| Pig iron, including cast | 15 | 22 | 1,018 | 1,055 | 11 | 558 | 8,294 | 8,863 |
| Sponge iron, powder, shot | (3) | (3) | 112 | 112 | (3) | (3) | 192 | 192 |
| Ferroalloys: | | | | | | | | |
| Ferromanganese | -- | -- | 2,322 | 2,322 | -- | -- | 2,409 | 2,409 |
| Other | 17 | 5 | 1,180 | 1,202 | (3) | -- | 2,269 | 2,269 |
| Steel, primary forms | 1,201 | 58 | 38,929 | 40,188 | 2,351 | 147 | 47,261 | 49,759 |
| Semimanufactures: | | | | | | | | |
| Bars, rods, angles, shapes, sections | 17,997 | 14,779 | 80,653 | 113,429 | 26,336 | 24,276 | 156,962 | 207,574 |
| Universals, plates, sheets | 8,984 | 7,642 | r 182,003 | 198,629 | 12,705 | 9,166 | 288,455 | 310,326 |
| Hoop and strip | 169 | 356 | r 43,591 | 44,116 | 346 | 469 | 41,112 | 41,927 |
| Rails and accessories | 275 | 100 | 4,123 | 4,498 | 337 | 2,116 | 4,616 | 7,069 |
| Wire | 2,278 | 2,838 | r 37,174 | 42,290 | 2,867 | 5,141 | 55,894 | 63,902 |
| Tubes, pipes, fittings | 10,559 | 5,985 | r 31,098 | 47,642 | 25,791 | 5,449 | 21,656 | 52,896 |
| Castings and forgings rough | 637 | 291 | 1,746 | 2,674 | 314 | 227 | 770 | 1,311 |
| Lead: | | | | | | | | |
| Ore and concentrate | -- | (3) | 16 | 16 | -- | -- | 143 | 143 |
| Oxides | 69 | 2 | 1,049 | 1,120 | 339 | (3) | 839 | 1,178 |
| Metal including alloys, all forms | (3) | 24 | r 2,383 | 2,407 | 1 | 21 | 2,799 | 2,821 |
| Magnesium metal including alloys, all forms | (3) | (3) | 24 | 24 | (3) | (3) | 4 | 4 |
| Manganese: | | | | | | | | |
| Ore and concentrate | (3) | -- | 283 | 283 | (3) | (3) | 834 | 834 |
| Oxides | (3) | (3) | 494 | 494 | 1 | (3) | 521 | 522 |
| Mercury - 76 pound flasks | 1 | 2 | 21 | 24 | -- | (3) | 70 | 70 |
| Molybdenum metal including alloys all forms | -- | -- | r 44 | 44 | -- | -- | 14 | 14 |
| Nickel metal including alloys all forms | 2,532 | (3) | r 76 | 2,608 | (3) | (3) | 703 | 703 |
| Platinum group metals including alloys troy ounces | -- | 2 | r 1,195 | 1,197 | 2 | 78 | 2,785 | 2,865 |
| Silver do | -- | 2,127 | 8,400 | 10,527 | 729 | 9,713 | 3,573 | 14,015 |
| Tantalum metal all forms | -- | -- | 35 | 35 | -- | -- | 16 | 16 |
| Tin: | | | | | | | | |
| Ore long tons | -- | -- | 17,824 | 17,824 | -- | -- | 14,920 | 14,920 |
| Slag and hardhead do | -- | -- | 6,629 | 6,629 | -- | -- | 2,100 | 2,100 |
| Metal including alloys, all forms | 46 | 39 | r 196 | 281 | 21 | 51 | 172 | 244 |
| Titanium: | | | | | | | | |
| Ore and concentrates | -- | -- | 12 | 12 | -- | -- | 145 | 145 |
| Oxides | -- | 1 | 2,197 | 2,198 | -- | (3) | 2,693 | 2,693 |
| Tungsten, ore and concentrate, gross weight | -- | (3) | 23 | 23 | -- | (3) | 130 | 130 |
| Zinc: | | | | | | | | |
| Ore | (3) | (3) | 4,980 | 4,980 | (3) | (3) | 6,185 | 6,185 |
| Oxide | 69 | 2 | 369 | 440 | 339 | 1 | 146 | 486 |
| Metal including alloys, all forms | 34 | 71 | r 4,537 | 4,642 | 21 | 96 | 4,288 | 4,405 |
| Zirconium, ore and concentrate, gross weight | -- | -- | 27 | 27 | -- | -- | 72 | 72 |
| Other: | | | | | | | | |
| Ore and concentrate | -- | 293 | 2 | 295 | -- | 47 | 2 | 49 |
| Ash and residue contain nonferrous metals | (3) | -- | 40 | 40 | -- | 102 | 526 | 628 |
| Metals including alloys, all forms | (3) | (3) | 2 | 2 | 2 | (3) | 2 | 4 |

See footnotes at end of table.

Table 3.—Malaysia: Imports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | | | | 1973 | | | |
|---|---|---|---|---|---|---|---|---|
| | Sabah | Sarawak | West Malaysia | Total [2] | Sabah | Sarawak | West Malaysia | Total [2] |
| NONMETALS | | | | | | | | |
| Abrasives, natural, n.e.s.: | | | | | | | | |
| Pumice, emery, etc | (3) | 1 | 166 | 167 | (3) | 1 | 172 | 173 |
| Dust and powder of precious and semiprecious stones value | $18 | -- | $387 | $400 | $46 | -- | $503 | $549 |
| Grinding and polishing wheels and stones | 22 | 30 | 708 | 760 | 35 | 27 | 910 | 972 |
| Asbestos | 1 | 2 | 12,772 | 12,775 | 28 | 3 | 15,199 | 15,230 |
| Barite and witherite | 4,960 | 3 | 122 | 5,085 | 1,454 | -- | 184 | 1,638 |
| Boron materials: | | | | | | | | |
| Crude natural borates | 5 | 729 | 285 | 1,019 | 61 | 1,212 | 161 | 1,434 |
| Oxides and acids | (3) | (3) | 109 | 109 | 1 | (3) | 100 | 101 |
| Cement | 106,218 | 83,513 | 20,950 | 210,681 | 111,551 | 98,919 | 20,710 | 231,180 |
| Chalk | (3) | (3) | 162 | 162 | 1 | -- | 434 | 435 |
| Clays and clay products: | | | | | | | | |
| Crude: | | | | | | | | |
| Bentonite | 1 | (3) | 336 | 337 | 229 | 1 | 414 | 644 |
| Kaolin | 15 | 12 | 1,234 | 1,261 | 5 | 16 | 1,099 | 1,120 |
| Fuller's earth | 3 | (3) | 1,035 | 1,038 | 18 | 8 | 2,521 | 2,547 |
| Mullite, chamotte, and dinas earth | -- | -- | 341 | 341 | -- | -- | 128 | 128 |
| Other | 4 | 35 | r 2,964 | 3,003 | 61 | 75 | 4,260 | 4,397 |
| Products: | | | | | | | | |
| Refractory | 857 | 87 | 12,579 | 13,523 | 171 | 190 | 9,517 | 9,878 |
| Nonrefractory | 1,979 | 1,812 | 3,422 | 7,213 | 2,092 | 1,735 | 7,201 | 11,028 |
| Cryolite and chiolite | -- | -- | (3) | (3) | -- | -- | 99 | 99 |
| Diamond: Gem, not set or strung value, thousands | -- | -- | $1,913 | $1,913 | -- | $2 | $2,258 | $2,260 |
| Diatomite and other infusorial earth | -- | -- | 70 | 70 | (3) | (3) | 256 | 256 |
| Feldspar | -- | -- | 3,535 | 3,535 | -- | -- | 5,728 | 5,728 |
| Fertilizer materials: | | | | | | | | |
| Crude: | | | | | | | | |
| Nitrogenous | (3) | 20 | 315 | 335 | -- | -- | 6 | 6 |
| Phosphatic | 161 | 5,831 | 125,838 | 131,830 | 246 | 5,530 | 145,011 | 150,787 |
| Potassic | 261 | 506 | 436 | 1,203 | 520 | 173 | 305 | 998 |
| Manufactured: | | | | | | | | |
| Nitrogenous | 2,819 | 5,199 | 74,338 | 82,356 | 3,385 | 4,993 | 100,081 | 108,459 |
| Phosphatic: | | | | | | | | |
| Thomas slag | -- | -- | 344 | 344 | -- | 14 | 115 | 129 |
| Other | 1,286 | 352 | 10,144 | 11,782 | 1,521 | 242 | 13,094 | 14,857 |
| Potassic | 5,773 | 910 | 138,924 | 145,607 | 4,865 | 934 | 145,083 | 150,882 |
| Other including mixed | 8,375 | 13,099 | 33,466 | 54,943 | 7,196 | 18,046 | 65,834 | 91,076 |
| Ammonia | 139 | 19 | r 9,743 | 9,901 | 296 | 13 | 841 | 1,150 |
| Fluorspar, leucite, etc | -- | -- | 4,611 | 4,611 | 13 | -- | 4,991 | 5,004 |
| Graphite, natural | 1 | (3) | 200 | 201 | (3) | (3) | 297 | 297 |
| Gypsum and plasters | 22 | 15 | 13,129 | 13,166 | 20 | 15 | 32,223 | 32,258 |
| Lime | 1,130 | 124 | 2,500 | 3,754 | 1,366 | 275 | 2,154 | 3,795 |
| Magnesite | (3) | -- | 245 | 245 | 2 | 30 | 319 | 351 |
| Mica, worked and unworked, including waste | (3) | (3) | 20 | 20 | -- | -- | 61 | 61 |
| Pigments, mineral: | | | | | | | | |
| Natural crude | 33 | 2 | 280 | 315 | 1 | -- | 210 | 211 |
| Iron oxides | 1 | 10 | 772 | 783 | 6 | 3 | 967 | 976 |
| Precious and semiprecious stones, except diamond: | | | | | | | | |
| Natural value | $5,176 | $1,608 | r $75,695 | $82,479 | $27 | $3,819 | $104,036 | $107,882 |
| Manufactured do | $35 | -- | $3,075 | $3,120 | $34 | -- | $12,479 | $12,513 |
| Pyrite | (3) | -- | 2 | 2 | -- | (3) | 69 | 69 |
| Salt and brine | 4,152 | 6,926 | 84,384 | 95,462 | 4,363 | 7,024 | 84,620 | 96,007 |
| Sodium and potassium compounds, n.e.s.: | | | | | | | | |
| Caustic soda | 44 | 135 | 6,375 | 6,554 | 48 | 239 | 10,219 | 10,506 |
| Caustic potash, sodic and potassic peroxides | 127 | 6 | 1,449 | 1,582 | 7 | 8 | 1,532 | 1,547 |
| Stone, sand and gravel: | | | | | | | | |
| Dimension stone, crude and worked | 171 | 241 | 1,431 | 1,843 | 51 | 144 | 2,045 | 2,240 |
| Dolomite, chiefly refractory grade | 20 | 395 | 77 | 492 | -- | 383 | 251 | 634 |
| Gravel and crushed rock | 11,576 | 276 | 1,226 | 13,078 | 5,393 | 538 | 1,181 | 7,112 |

See footnotes at end of table.

Table 3.—Malaysia: Imports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | | | | 1973 | | | |
|---|---|---|---|---|---|---|---|---|
| | Sabah | Sarawak | West Malaysia | Total [2] | Sabah | Sarawak | West Malaysia | Total |
| NONMETALS—Continued | | | | | | | | |
| Stone, sand and gravel—Continued | | | | | | | | |
| Limestone (except dimension) | 34 | 132 | 903 | 1,069 | 398 | 121 | 828 | 1,347 |
| Quartz and quartzite | -- | -- | 6 | 6 | -- | -- | 9 | 9 |
| Sand excluding metal bearing | 454 | (3) | 430 | 884 | 179 | 20 | 542 | 741 |
| Sulfur: | | | | | | | | |
| Elemental | 17 | 3 | 12,854 | 12,874 | 13 | 1 | 13,958 | 13,972 |
| Sulfur dioxide | (3) | (3) | 3 | 3 | (3) | (3) | 8 | 8 |
| Sulfuric acid | 91 | 46 | 57 | 194 | 107 | 54 | 55 | 216 |
| Talc, steatite, soapstone, pyrophyllite | 115 | 31 | r 3,447 | 3,593 | 125 | 64 | 4,314 | 4,503 |
| Other nonmetals, n.e.s.: | | | | | | | | |
| Crude | 38 | 729 | 31,614 | 32,381 | 10 | 1,212 | 35,095 | 36,317 |
| Slag, dross and similar waste, nonmetal bearing | (3) | -- | 121 | 121 | 3 | -- | 253 | 256 |
| Oxides and hydroxides of magnesium, barium and strontium | 8 | (3) | 29 | 37 | 1 | 30 | 685 | 716 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | | | |
| Asphalt and bitumen, natural | 894 | 159 | 1,185 | 2,238 | 2,639 | 150 | 1,526 | 4,315 |
| Carbon black | 39 | (3) | r 8,459 | 8,498 | 80 | 5 | 8,380 | 8,465 |
| Coal, coke and briquets: | | | | | | | | |
| Anthracite and bituminous coal and briquets | 1 | -- | r 4,455 | 4,456 | (3) | 1 | 13,342 | 13,343 |
| Lignite and lignite briquets | -- | -- | (3) | (3) | 102 | -- | -- | 102 |
| Coke and semicoke | 18 | 17 | 9,982 | 10,017 | 17 | 95 | 38,813 | 38,925 |
| Oxygen, hydrogen, nitrogen and rare gasses | $91,019 | $64,218 | $139,000 | $294,237 | $168,528 | $82,378 | $191,309 | $442,215 |
| Peat | 24 | -- | 20 | 44 | 39 | -- | 8 | 47 |
| Petroleum: | | | | | | | | |
| Crude thousand 42-gallon barrels | -- | 11,001 | 19,220 | 30,221 | -- | 6,725 | 20,627 | 27,352 |
| Partly refined do | -- | 306 | 1,100 | 1,406 | -- | 1,652 | 753 | 2,405 |
| Refinery products: | | | | | | | | |
| Gasoline do | 683 | 221 | 1,169 | 2,073 | 735 | 303 | 1,043 | 2,081 |
| Jet fuel do | 103 | 117 | 651 | 871 | 146 | 127 | 534 | 807 |
| Kerosine do | 182 | 85 | 530 | 797 | 179 | 117 | 525 | 821 |
| Distillate fuel oil do | 976 | 430 | r 6,650 | 8,056 | 1,163 | 303 | 5,179 | 6,645 |
| Residual fuel oil do | 126 | 5 | 374 | 505 | 219 | 68 | 1,264 | 1,551 |
| Lubricants do | 47 | 27 | r 420 | 494 | 62 | 60 | 662 | 784 |
| Other: | | | | | | | | |
| White spirits do | (3) | (3) | 119 | 119 | 1 | (3) | 97 | 98 |
| Mineral jelly and wax do | (3) | (3) | 41 | 41 | (3) | (3) | 53 | 53 |
| Nonlubricating oils do | 7 | 2 | 212 | 221 | 17 | 1 | 85 | 103 |
| Petroleum coke do | (3) | -- | 65 | 65 | -- | -- | 58 | 58 |
| Bitumen and other residues do | 55 | 39 | 72 | 166 | 43 | 38 | 104 | 185 |
| Liquefied petroleum gas value, thousands | $269 | $192 | $558 | $1,019 | $379 | $318 | $952 | $1,649 |
| Not specified thousand 42-gallon barrels | (3) | -- | 39 | 39 | (3) | (3) | 34 | 34 |
| Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals | 55 | 67 | 1,682 | 1,804 | 51 | 146 | 1,876 | 2,073 |

[1] Imports for each region include imports from each of the other regions of Malaysia.
[2] Total may not add due to roundoff error.
[3] Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Tin.**—Malaysia continued to lead the world in production, smelting, and exports of tin in 1974. A total of 67,048 long tons of tin-in-concentrate was mined, the lowest level since 1965 and down 6% from 1973 production because of depletion of tin deposits and higher mining costs. At yearend there were 56 tin dredges, 932 gravel pump mines, and 37 opencast, underground and other miscellaneous mines in operation, reflecting a 5% increase in total active mines through the year. Gravel pump operations, worked for the most part by the same families that own the mines, accounted for 53% of the concentrates produced, while dredging by corporations furnished another 33%. Opencast mines brought in 4% of the ore produced, underground mines accounted for 4%, and the remaining 6% came from miscellaneous sources. The tin mining labor force increased to 44,050 workers at yearend from 41,744 yearend 1973.

Metal production, at 85,748 long tons, was 7% above the 1973 level. Exports of metal increased to 83,883 long tons from 80,256 long tons in 1973.

In a move to increase domestic control over its economy and correct racial economic imbalance, the Malaysian Government announced a policy of regulating foreign investment in future company mergers and takeovers. The goal for the tin industry would be 70% domestic ownership by 1990. The Malaysian national's (*Bumiputra*) share will be increased from 2% to 30%, with the Chinese and Indian share at 40%, and foreign ownership at 30%. Tin production has been dominated by Chinese-owned gravel pumps and European-controlled dredging operations. No takeovers or expropriations were envisioned. *Bumiputra* will secure a larger share of new mining areas for gravel pump ventures. The flow of foreign investment capital into the Malaysian economy will continue to be promoted to supplement capital requirements for rapid development.

In April, the Government imposed a variable surcharge on tin as part of a broad-based antiinflation program. The tax ranged from 0% to 5% depending upon the price, starting when the price went above M$700 per picul (218 cents per pound) and increasing to 5% when the price went above M$1,200 per picul (374 cents per pound).

Perbadanan Nasional Bhd. (Pernas), Malaysia's national mining corporation, announced two tin finds, one off the coast of Malacca and the other offshore from Perak, in its 41,000-square-kilometer concession off Malaysia's west coast. The size of the finds was not published although the Malacca find was termed substantial. Further drilling was undertaken to establish the size of the Perak deposit. Pernas was negotiating with overseas companies to exploit the deposits.

A $500,000 feasibility survey of Selangor's Kuala Langat forest reserve indicated rich, deep-seated deposits spread over 16,000 hectares. Many deposits occur below 60 meters, well below the maximum operating depth of existing dredges, indicating that the mining of the deposits will cost more than mining the shallow alluvial deposits of the Kinta Valley, the area contributing most to Malaysia's tin output during this century. Four dredges operated in the Kuala Langat District at yearend, Selangor Dredging Bhd. operated two, and Petaling Tin Bhd. and Conzinc Riotinto Malaysia Sdn. Bhd. each operated one. The Selangor State Government planned to operate three dredges in the area, the first, costing over $5 million, to go into operation in mid-1976.

Pahang State made available about 100,000 hectares for tin prospecting in the Pahang Tenggara Development area. The State of Kelantan signed an agreement with Anglo-Oriental (Malaysia) Sdn. Bhd. for mineral prospecting of an area larger than 20,000 hectares. Kelantan has not been a major mining state.

Production of tin-in-concentrate by Berjuntai Tin Dredging Bhd. increased 7% to 3,701 long tons during its fiscal year. Building of the No. 8 dredge continued on schedule with launching of a pontoon in November. The dredge will replace the No. 1 dredge which has been operating in Selangor for about 50 years. The estimated cost of the dredge, at $7 million, was about half the total cost for the seven other dredges the company owned.

Southern Kinta Consolidated Ltd., with an output of about 1,600 long tons of concentrate in 1974, was refused renewal of a mining title to 40 hectares in the Rasa sec-

tion of Selangor by the Selangor State Government. Upon appeal, Southern Kinta was informed that the title had been granted to another company. The dredgable portions of the area would have provided up to 2 years of production for the Rasa dredge.

Tronoh Mines, Ltd. and Perak State Development Corp. (PSCD) formed a joint venture to exploit tin reserves in the Batang Padang area adjacent to Tronoh's existing leases. The company, owned 70% by Tronoh and 30% by PSDC, was the first joint venture between the private sector and a State government. A dredge of 600,000 cubic meters monthly capacity will be ordered to mine the area estimated to have reserves of about 100 million cubic meters grading 0.16 kilogram per cubic meter.

Tronoh later was included in another joint venture in which the Selangor State Development Corp. holds 55%, Charter Consolidated (Malaysia), Ltd. 36%, and Tronoh 9%, that will develop deep-seated reserves in southern Selangor. Substantial work will be necessary to complete a feasibility study and mining plan but if findings are acceptable, mining operations could start in 5 years.

Gopeng Consolidated Ltd. acquired 225 hectares of mining land in the Mukim area, Chenderiang district of Batang Padang, Perak, subject to 30% *Bumiputra* participation required by Malaysia's new economic plan. The need to replenish reserves was evident from Gopeng's declining production, down 12% from 1973 to 2,377 long tons of concentrate in 1974.

Conzinc Riotinto Malaysia Sdn. Bhd., a joint venture between The Rio Tinto-Zinc Corp. Ltd. (41.25%), Cozinc Riotinto of Australia Ltd. (CRA) (13.75%), and Bethlehem Steel Corp. (45%), experienced numerous production problems with its new dredge requiring modifications to the treatment plant and the design of the dredge itself. Production in 1974 was 350 long tons below its designed capacity of 1,000 long tons of concentrate per year.

Pacific Tin Consolidated Corp., the only U.S. company mining tin in Malaysia, showed decreases in total yardage treated and tin recovered in 1974. Dredge No. 8 was shutdown from May to November because of structural failure and collapse of the dredge's digging ladder.

Syarikat Eastern Smelting Bhd. will move its smelting facilities from Penang Island to the mainland. Although the move would allow expansion of the facilities, the main reason for the move was to allow redevelopment of the present 5-hectare site into a building complex.

**Titanium.**—The Trengganu State Economic Development Corp. announced the formation of Syarikat Lombong Titanium Trengganu Sdn. Bhd., a joint venture with local industry, which began mining ilmenite in February at Bukit Payong. Production of 10,000 tons per year was expected.

## NONMETALS

**Cement.**—The Perlis State Government was studying the feasibility of establishing a second cement plant because of a cement shortage. The State's first cement plant at Chuping, a joint venture between the State Development Corp. and the private sector, was expected to go into full production by late 1975 with an output of 20,000 tons per month.

A new cement plant with a capacity of 300,000 tons per year to be located in Sarawak to supply the needs of both Sarawak and Sabah was under study.

## MINERAL FUELS

**Petroleum.**—In August, the Malaysian Government established a national oil company Petronas giving it ownership of all oil deposits, exclusive rights for petroleum exploration and exploitation, control of downstream activities, and licensing powers. All companies engaged in these activities were given 6 months from October 1 to obtain permission to continue their activities. Although terms of the new contracts were not finalized, the renegotiated contracts will become production-sharing contracts in which the production costs will be recovered from the first 40% of the production and the remainder will be split two-thirds for the Government and one-third for the companies.

Crude oil production, which up to late 1974 had all come from long established Shell Oil Co. (Shell) Sarawak operations, averaged about 80,000 barrels per day. In late 1974, Exxon began production at its Tembungo Field, about 85 kilometers northwest of Kota Kinabala, Sabah, at a rate of 3,000 to 5,000 barrels per day.

Production of 100,000 barrels per day was anticipated after installation of a new production platform.

Shell's two Sabah Fields, Semarang and Erb West, were rated commercial and production plans to bring Semarang onstream by mid-1975 at an initial rate of 30,000 barrels per day via a 30-mile submarine pipeline to a Labuan Island terminal were formulated. Production at the Erb West Field will follow at about 120,000 barrels per day. The Labuan terminal will have a 150,000-barrel-per-day capacity with a single-buoy mooring system 5 miles offshore. Jetty and mooring facilities for tankers up to 200,000 tons will be provided. Total reserves for the Semarang and Erb West Fields were placed at 200 million barrels.

The Continental Oil Co. (Conoco) group, consisting of Conoco (50%), Broken Hill Pty Co., Ltd. (BHP) (25%), and El Paso Natural Gas Co. (25%), continued to explore the Sotong structure, 160 kilometers off Kuantan on West Malaysia's east coast, making additional discoveries of oil and gas.

North of Conoco's Field, and about 260 kilometers northeast of Kuala Trengganu, Exxon struck oil at its Pulai 1 wildcat well. The well tested over 2,500 barrels per day. Two 24-slot drilling and production platforms were ordered. The field was expected to come onstream in late 1975.

# The Mineral Industry of Mexico

By Ronald J. DeFilippo [1]

Despite declining world metal and mineral prices, Mexico continued to expand its mining industry. Much of the Government's share of profits from its partial or complete ownership in various phases of the mineral industry was reinvested for further development. Furthermore, the Government provided investment capital and support to small- and medium-sized mining operations through the governmental Mining Development Commission (Comision de Fomento Minera).

The mineral industry contributed 1.6% of the gross domestic product (GDP). Banco de Mexico, S.A., estimated the growth rate of the mining industry at 11% in 1974 and that of the petroleum industry at 15%, compared with 1973 growth rates of 8.8% and 1.4%, respectively. Most mineral commodities showed modest to significant gains in production over that of 1973. As a whole, Mexico's economy has shown steady progress since 1972 through a series of investments in key sectors such as mining, petroleum, and fertilizers.

In the late 1960's, Mexico began the policy of "Mexicanization," which required that all mining ventures be at least 51% Mexican owned, or at least 66% Mexican owned if the company wished to bid for concessions owned by the Ministry of National Patrimony. This policy was put into effect gradually but, by the end of 1974, 98% of the country's mineral output (almost 800 mining companies) was controlled or owned by Mexicans. Nationalist sentiment regarding control of the mining industry was relatively moderate; foreign interests still had a role if they were willing to comply with article 27 of the Mexican Constitution regarding the exploitation and use of mineral resources.

On the international level, representatives of Mexico's mercury producers met with those of other major world producers in an attempt to set a floor price for mercury. However, Mexico's internationalism centered largely on other Latin American countries. The Mexicans were promoting the Latin American Free Trade Association, which was envisioned as a combination common market and producer cartel of Latin American countries, with Mexico providing the leadership.

## PRODUCTION

Of 12 selected metals produced in 1974, only the mine production of nickel, silver, tungsten, and zinc showed lower output than that of 1973. The largest gainers among the major metals were copper, up 3%; iron, 7%; lead, 22%; and manganese, 11%. Among the lower volume metals, cadmium gained 33%; gold, 1%; mercury; 20%, and tin; 37%. Silver and zinc mine production dropped 3% each, while tungsten and nickel dropped 11% and 22%, respectively.

The total production of nonmetallic minerals rose 4% over 1973. Major increases were posted by barite, up 6%; clays, 5%; diatomite, 21%; feldspar, 91%; fluorspar, 2%; dolomite, 4%; quartz, quartzite, and glass sand, 25%; strontium minerals, 62%; sulfur, 44%; talc, 26%; and wollastonite, 25%. Losses in production of major nonmetallic minerals were sustained by graphite, down 4%; magnesite, 23%; perlite, 10%; and sodium sulfate, 15%. Production of bituminous coal increased 21% over 1973, while crude pertoleum production increased 27%.

[1] Physical scientist, Division of Nonferrous Metals.

## Table 1.—Mexico: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Aluminum, primary | 39,483 | 39,161 | 40,862 |
| Antimony: | | | |
| Mine output, metal content | 2,976 | 2,388 | 2,407 |
| Metal (in mixed bars) | 758 | 903 | NA |
| Arsenic, white [2] | r 5,918 | 5,086 | 9,505 |
| Bismuth, content of exported concentrates, bullion, and refined metal | 629 | 585 | 718 |
| Cadmium: | | | |
| Mine output, metal content | 1,757 | 1,477 | 1,960 |
| Metal, refined | 186 | 182 | 527 |
| Copper: | | | |
| Mine output, metal content | 78,720 | 80,501 | 82,670 |
| Electrolytic solution [3] | 67 | 4 | -- |
| Metal: | | | |
| Blister | 74,236 | 73,034 | 78,310 |
| Refined | 59,591 | 57,212 | 68,201 |
| Gold: | | | |
| Mine output, metal content ---- troy ounces | 146,061 | 132,557 | 134,454 |
| Metal, refined ---- do | 137,412 | 123,201 | 127,285 |
| Iron and steel: | | | |
| Iron ore: | | | |
| Gross weight [4] ---- thousand tons | 5,089 | 5,189 | 5,564 |
| Metal content ---- do | 3,053 | 3,113 | 3,338 |
| Pig iron and sponge iron ---- do | 2,674 | 2,775 | 3,207 |
| Ferroalloys ---- do | 77 | 82 | 88 |
| Crude steel ---- do | 4,431 | 4,760 | 5,116 |
| Steel semimanufactures ---- do | 3,473 | 3,602 | 4,188 |
| Lead: | | | |
| Mine output, metal content | 161,358 | 179,296 | 218,021 |
| Smelter (in refined and mixed bars) | 155,820 | 172,929 | 200,180 |
| Manganese ore: | | | |
| Gross weight [5] | 295,622 | 364,025 | 403,134 |
| Metal content | 106,424 | 131,049 | 145,128 |
| Mercury, mine output, metal content -- 76-pound flasks | 22,510 | [6] 21,640 | 25,933 |
| Molybdenum, mine output, metal content | 78 | 41 | 43 |
| Nickel, mine output, metal content | 17 | 32 | 25 |
| Selenium, metallic | 44 | 39 | 50 |
| Silver: | | | |
| Mine output, metal content --- thousand troy ounces | 37,483 | 38,788 | 37,546 |
| Metallurgical products, metal content ---- do | 36,263 | 37,394 | 34,987 |
| Tin: | | | |
| Mine output, metal content ---- long tons | 348 | 287 | 394 |
| Smelter, primary [e 7] ---- do | 950 | 950 | 1,000 |
| Tungsten, mine output, metal content | 362 | 348 | 309 |
| Zinc: | | | |
| Mine output, metal content | 271,844 | 271,373 | 262,716 |
| Smelter, primary | r 83,788 | 71,423 | 133,368 |
| **NONMETALS** | | | |
| Asbestos | -- | 15 | 5 |
| Barite | 261,403 | 255,257 | 271,710 |
| Cement, hydraulic ---- thousand tons | 8,602 | 9,787 | 10,500 |
| Clays: | | | |
| Bentonite | 37,984 | 45,793 | 61,185 |
| Fuller's earth | 30,392 | 50,303 | 53,861 |
| Kaolin | 71,891 | 94,364 | 93,372 |
| Refractory | 111,080 | 141,263 | 138,353 |
| Diatomite | 9,077 | 19,559 | 23,630 |
| Feldspar | 98,363 | 97,107 | 185,304 |
| Fertilizer materials: | | | |
| Crude, phosphate rock | 62,674 | 71,542 | 72,000 |
| Manufactured: | | | |
| Nitrogenous, gross weight -- thousand tons | 906 | 971 | e 930 |
| Phosphatic, gross weight ---- do | 456 | 485 | e 500 |
| Mixed, gross weight ---- do | 329 | 370 | e 330 |
| Fluorspar, all grades | 1,042 | 1,086 | 1,112 |
| Graphite, all grades | 55,110 | 65,392 | 62,551 |
| Gypsum and anhydrite, crude ---- thousand tons | 1,498 | 1,514 | 1,387 |
| Magnesite | 20,858 | 28,725 | 22,126 |
| Mica, all grades | 826 | 782 | 844 |
| Perlite | 12,868 | 13,479 | 12,136 |
| Salt, all types ---- thousand tons | 4,558 | 4,319 | e 4,300 |
| Stone, sand, and gravel: | | | |
| Calcite, common | r 3,987 | 4,378 | 5,504 |
| Dolomite | 485,956 | 410,120 | 426,717 |
| Limestone [8] ---- thousand tons | 4,068 | 3,419 | 3,456 |
| Marble | 5,826 | 3,767 | 5,694 |
| Quartz, quartzite, glass sand | 404,567 | 411,432 | 513,984 |

See footnotes at end of table.

Table 1—Mexico: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Stone, sand and gravel—Continued | | | | |
| Cobblestone | | 5,112 | 4,833 | NA |
| Strontium minerals | | 24,424 | 18,273 | 29,545 |
| Sulfur, elemental: | | | | |
| Frasch process | thousand tons | 861 | 1,544 | 2,257 |
| Other native mined | do | 21 | -- | -- |
| Byproduct from natural gas | do | 62 | 64 | 65 |
| Total | do | 944 | 1,608 | 2,322 |
| Sulfates, natural sodium | | 127,890 | 173,991 | 148,271 |
| Talc and related materials | | 3,130 | 2,108 | 2,649 |
| Wollastonite | | 599 | 1,593 | 1,984 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Carbon black [e] | | 33,500 | 33,500 | 34,000 |
| Coal, bituminous | thousand tons | [r] 3,614 | 4,263 | 5,166 |
| Coke: | | | | |
| Metallurgical | do | [r] 1,724 | 1,904 | 2,034 |
| Imperial | do | 11 | 11 | 17 |
| Breeze | do | [r] 21 | 19 | 20 |
| Total | do | 1,756 | 1,934 | 2,071 |
| Gas: | | | | |
| Manufactured, all types | million cubic feet | [r] 6,027 | 6,596 | [e] 7,200 |
| Natural: | | | | |
| Gross production | do | 660,232 | 676,750 | 744,673 |
| Marketable production | do | 496,019 | 541,772 | 560,911 |
| Natural gas liquids: | | | | |
| Field condensate | thousand 42-gallon barrels | 39 | 28 | 29 |
| Other | do | 23,644 | 26,573 | 28,416 |
| Petroleum: | | | | |
| Crude | do | 161,328 | 164,881 | 209,826 |
| Refinery products: | | | | |
| Aviation gasoline | do | 504 | 457 | 432 |
| Other gasoline | do | 55,602 | 58,155 | 65,023 |
| Jet fuel | do | 3,621 | 4,445 | 5,792 |
| Kerosine | do | 11,572 | 12,366 | 12,821 |
| Distillate fuel oil | do | 34,502 | 38,274 | 48,845 |
| Residual fuel oil | do | 52,116 | 54,743 | 63,532 |
| Lubricants | do | 2,270 | 2,367 | 2,744 |
| Liquefied petroleum gas | do | 14,729 | 17,178 | 18,276 |
| Asphalt | do | 8,645 | 7,686 | 4,750 |
| Other | do | [r] 4,220 | 4,744 | 4,651 |
| Refinery fuel and losses | do | 9,440 | 10,373 | 8,713 |
| Total | do | 197,221 | 210,788 | 235,579 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, lime, pumice, and additional types of crude construction materials are also produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[2] Calculated white-arsenic equivalent of metallic-arsenic content of products reported.

[3] For export.

[4] Calculated on the basis of ore containing 60% iron, from reported metal content of mine production.

[5] Calculated on the basis of ore containing 36% manganese, from reported metal content of mine production.

[6] Exports.

[7] Series revised to include tin recovered from imported ores; smelter tin output from ores of Mexican origin was as follows, in long tons: 1972—348, 1973—287, and 1974—394.

[8] Excluding that for cement production.

## TRADE

Preliminary data indicated that the 1974 mineral export value was over twice that of 1973. Metals experienced a two-fold increase in value, while fuels increased about fourfold. The following mineral exports increased twice or more in value: bismuth, lead, refined zinc and zinc in concentrate, sulfur, and petroleum. The export values of copper and natural gas were lower than those in 1973.

## Table 2.—Mexico: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Oxide (alumina) | 14 | 25 | United States 15; Venezuela 7. |
| Metal, including alloys, all forms | 1,282 | 822 | Colombia 465; United States 229; Ecuador 48. |
| Antimony: | | | |
| Ore and concentrate, gross weight | 7,605 | 6,226 | All to United States. |
| Metal, including alloys, all forms | 258 | 100 | Colombia 77; United States 23. |
| Arsenic: | | | |
| Oxide, gross weight: | | | |
| White | 2,539 | 5,269 | United States 5,103; Brazil 109; Japan 54. |
| Black | 209 | 82 | All to United States. |
| Speiss and similar materials, oxide content | 49 | -- | |
| Bismuth: | | | |
| Ore and concentrate, gross weight | 2 | -- | |
| Metal, including alloys, all forms | 761 | 675 | United States 330; United Kingdom 202; Brazil 64. |
| Cadmium: | | | |
| Concentrate and speiss, gross weight | -- | 23 | All to United States. |
| Flue dust, metal content | 452 | 253 | Do. |
| Metal | 152 | 151 | Brazil 69; United States 55; Netherlands 22. |
| Copper: | | | |
| Ore and concentrate, gross weight[1] | 15,204 | 16,126 | United States 12,956; Belgium-Luxembourg 3,169. |
| Copper sulfate | 375 | 964 | Brazil 742; United States 221. |
| Metal, including alloys: | | | |
| Scrap | 289 | 2,045 | All to United States. |
| Unwrought and semimanufactures | 31,699 | 28,901 | United States 12,781; Japan 7,339; Colombia 1,472. |
| Gold[1] troy ounces | 1,133 | -- | |
| Iron and steel: | | | |
| Ore and concentrate, gross weight | 24 | -- | |
| Metal, including alloys: | | | |
| Scrap | 6,630 | 3,617 | All to United States. |
| Ferroalloys: | | | |
| Ferrosilicomanganese | 4,493 | 3,862 | Do. |
| Other | (2) | 400 | Colombia 300. |
| Steel, primary forms | 1,072 | (2) | Mainly to United States. |
| Semimanufactures | 390,365 | 135,371 | United States 100,409; Guatemala 13,141; Cuba 6,050. |
| Lead: | | | |
| Ore and concentrate, gross weight | 199 | 3,224 | All to United States. |
| Oxides: | | | |
| Litharge | 29,077 | 40,269 | United States 12,820; Italy 10,387; Netherlands 4,054. |
| Red lead | 2,739 | 2,423 | United States 630; Japan 297; Colombia 268. |
| Metal, including alloys: | | | |
| Scrap | 8 | 4 | All to United States. |
| Unwrought: | | | |
| Antimonial and other bars | 8,637 | 8,064 | Netherlands 5,199; United States 1,508; Venezuela 776. |
| Refined | 66,253 | 56,013 | Italy 25,736; United States 11,478; Brazil 9,415. |
| Semimanufactures | 1,038 | 891 | United States 773; Canada 109. |
| Manganese ore and concentrate, gross weight | 147,706 | 195,863 | United States 85,171; Japan 60,050; France 26,770. |
| Mercury 76-pound flasks | 23,913 | 21,646 | United States 7,167; Japan 5,755; Brazil 3,296. |
| Nickel metal, including alloys, all forms | 2 | 3 | Costa Rica 2. |
| Selenium: | | | |
| Elemental | 43 | 35 | United Kingdom 23; United States 11. |
| Matte, speiss, anode slimes and smelter residues | 67 | -- | |
| Silver[1] thousand troy ounces | 12,927 | 466,120 | United States 442,936; Japan 12,789; Spain 1,897. |
| Tin metal, including alloys, all forms long tons | 3 | 17 | Mainly to United States. |
| Tungsten ore and concentrate, gross weight | 475 | 522 | United States 267; United Kingdom 130; France 54. |

See footnotes at end of table.

## Table 2—Mexico: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Zinc: | | | |
| Ore and concentrate, gross weight | r 300,978 | 241,351 | United States 110,075; West Germany 42,390; Japan 32,802. |
| Oxide, white | 7,119 | 9,333 | United States 8,776; Canada 231; Venezuela 92. |
| Sulfate | 2,389 | 4,672 | United States 4,543; Canada 101; Venezuela 15. |
| Metal, including alloys: | | | |
| Powder | 1,098 | 924 | Argentina 468; Colombia 269; United States 181. |
| Unwrought | r 40,322 | 12,076 | Brazil 5,370; United States 1,423; Colombia 1,266. |
| Semimanufactures | 2 | 1 | All to Costa Rica. |
| Other nonferrous base metals: | | | |
| Ores, concentrates, and metallurgical residues except scrap | 2,072 | 2,118 | All to United States. |
| Metal, all forms | 34 | 140 | Mainly to United States. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Emery | 1 | 1 | Mainly to Costa Rica and Dominican Republic. |
| Pumice | 56 | 98 | United States 68; Cuba 30. |
| Asbestos | 34 | 16 | Mainly to Guatemala. |
| Barite and witherite | 132,263 | 132,565 | All to United States. |
| Cement | 267,647 | 170,400 | United States 168,928; Costa Rica 753. |
| Clays and clay products: | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 211 | 23 | New Zealand 20; United States 2. |
| Fuller's earth and other earth | 10,259 | 11,586 | Brazil 4,079; United States 2,451; Peru 1,132. |
| Kaolin (china clay) | 94 | 259 | Cuba 178; Venezuela 55; Colombia 16. |
| Other | 132 | 179 | Peru 44; Panama 44; Colombia 24. |
| Products: | | | |
| Refractory | 142 | 20 | Guatemala 19; United States 1. |
| Nonrefractory | 81,664 | 173,406 | United States 172,806; Guatemala 200. |
| Diamond, industrial carats | 5,000 | 5,000 | All to United States. |
| Diatomite and other infusorial earth | 9,339 | 9,081 | Argentina 2,316; Brazil 1,980; Venezuela 1,367. |
| Feldspar | 102 | -- | |
| Fertilizer materials: | | | |
| Crude, phosphatic | 6,482 | 1,973 | All to United States. |
| Manufactured: | | | |
| Nitrogenous, including urea | 134,978 | 77,899 | Nicaragua 20,889; Peru 17,340; Guatemala 9,494. |
| Phosphatic | 124,625 | 98,754 | United States 44,505; Chile 18,000; Brazil 14,992. |
| Potassic | 525 | 289 | Mainly to Guatemala. |
| Other, including mixed | 942 | 446 | United States 394; El Salvador 25. |
| Ammonia | 190 | 3,466 | Guatemala 3,038; United States 384. |
| Fluorspar: | | | |
| Acid grade | 390,180 | 382,810 | United States 378,845; Netherlands 3,702. |
| Metallurgical grade | 631,793 | 635,537 | United States 504,829; Canada 120,099; Italy 6,671. |
| Graphite, natural | 44,359 | 57,228 | Mainly to United States. |
| Gypsum: | | | |
| Crude thousand tons | 1,464 | 1,187 | United States 958; Canada 74; Japan 73. |
| Calcined | 17 | 53 | All to United States. |
| Lime | 1,167 | 1,205 | United States 855; Costa Rica 120; El Salvador 100. |
| Mica | 10 | -- | |
| Perlite | 916 | 1,183 | Venezuela 314; Colombia 276; Brazil 247. |
| Precious and semiprecious stones, except diamond kilograms | 289 | 3,050 | Australia 2,265; United States 299; Italy 198. |
| Salt thousand tons | 4,969 | 3,929 | Japan 2,861; United States 780. Canada 274. |
| Sodium and potassium compounds: | | | |
| Sodium compounds: | | | |
| Sodium carbonate | 833 | 797 | Chile 221; Argentina 200; Honduras 200. |
| Sodium hydroxide | 3,202 | 5,060 | Argentina 4,934; El Salvador 75; Guatemala 29. |
| Sodium sulfate: | | | |
| Natural (bloedite) | 253 | -- | |
| Other | 47,716 | 65,785 | Brazil 47,044; Venezuela 7,439; Colombia 4,608. |
| Potassium compounds | 4 | 28 | Guatemala 21; Belize 5. |

See footnotes at end of table.

## Table 2—Mexico: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel: | | | |
| Dimension stone | 10,719 | 15,210 | Mainly to United States. |
| Crushed rock | 13,703 | 25,504 | All to United States. |
| Limestone, dolomite, calcite | 4,067 | 4,403 | Mainly to United States. |
| Quartz and quartzite | 3,386 | 5,735 | All to United States. |
| Sand: | | | |
| Construction | 439 | 3,371 | United States 3,319; West Germany 52. |
| Glass | 26,555 | 28,074 | Guatemala 28,029. |
| Stone, industrial, not specified | 20 | -- | |
| Strontium minerals | 24,332 | 21,358 | All to United States. |
| Sulfur: | | | |
| Elemental, all forms | 479,407 | 842,962 | United States 365,944; United Kingdom 171,475; France 71,482. |
| Sulfuric acid | 4,572 | 3,906 | Guatemala 3,851; Costa Rica 24; United States 15. |
| Talc, steatite, soapstone, pyrophyllite | 4 | 542 | All to United States. |
| Wollastonite | 544 | 2,102 | United States 1,786; Guatemala 225. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural (including gilsonite) | 31 | 37 | Spain 21; Denmark 10. |
| Carbon black | 1,306 | 789 | Costa Rica 505; Trinidad and Tobago 165; Brazil 54. |
| Coal and coke | (2) | 2 | All to United States. |
| Gas, natural -- million cubic feet | 9,830 | 1,971 | Do. |
| Petroleum refinery products: | | | |
| Gasoline thousand 42-gallon barrels | -- | 158 | Mainly to Chile. |
| Kerosine do | -- | 109 | All to Chile. |
| Distillate fuel oil thousand 42-gallon barrels | 40 | 192 | United States 147; Greece 11; United Kingdom 5. |
| Residual fuel oil do | 5,055 | 4,826 | United States 4,463; Canada 263; Liberia 46. |
| Lubricants do | 1 | 1 | Mainly to Guatemala and United States. |
| Other: | | | |
| Liquefied petroleum gas do | 8 | (2) | Mainly to United States and Belize. |
| Mineral jelly and wax do | 12 | 37 | Mainly to United States. |
| Asphalt do | 4,086 | 2,629 | Do. |
| Total do | 9,202 | 7,952 | |

r Revised.

1 Source: Consejo de Recursos Naturales No Renovables, Gerencia de Estudios Economicos. Anuario Estadistico de la Minera Mexicana 1972, 1973, Mexico, D.F., 1973, 128 pp. and 1974, 146 pp.

2 Less than ½ unit.

Source: Unless otherwise specified, official Mexican export returns.

## Table 3.—Mexico: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 25,986 | 17,950 | Mainly from United States. |
| Oxide and hydroxide | 88,996 | 91,922 | United States 82,628; West Germany 4,257; Switzerland 3,955. |
| Metal, including alloys, all forms | 13,672 | 36,971 | United States 30,372; Yugoslavia 2,512; Canada 997. |
| Antimony metal, including alloys, all forms kilograms | 266 | -- | |
| Arsenic: | | | |
| Natural sulfides | -- | 58 | All from United States. |
| Trioxide, pentoxide, acids | 3 | 1 | Mainly from United States. |
| Metal, including alloys, all forms | 11 | 6 | Mainly from France. |
| Beryllium metal, including alloys, all forms kilograms | 3,044 | 2,600 | Mainly from United States. |
| Bismuth metal, including alloys, all forms do | 1,783 | 4,636 | United States 3,631; Italy 1,005. |
| Cadmium metal, including alloys, all forms do | 56 | 33 | West Germany 20; United States 13. |
| Chromium: | | | |
| Chromite | 26,144 | 36,793 | All from United States. |
| Oxide and hydroxide | 330 | 4 | Mainly from United States. |

See footnotes at end of table.

## Table 3—Mexico: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Cobalt: | | | |
| Oxide and hydroxide | 88 | 134 | Belgium-Luxembourg 104; United States 30. |
| Metal, including alloys, all forms | 27 | 44 | Belgium-Luxembourg 40; United States 3. |
| Copper metal, including alloys: | | | |
| Scrap | 392 | 1,531 | United States 583. |
| Copper sulfate | 2 | 2 | NA. |
| Unwrought | 116 | 495 | United States 392; Italy 79; West Germany 17. |
| Semimanufactures | 964 | 1,535 | United States 815; West Germany 279; United Kingdom 78. |
| Gold metal, unworked or partly worked troy ounces | 3,524 | 4,598 | West Germany 850; United States 200; Netherlands 199. |
| Iron and steel: | | | |
| Ore and concentrate, gross weight | 109,667 | 74,671 | Panama 73,615; United States 555; France 500. |
| Metal: | | | |
| Scrap | 527,380 | 966,854 | United States 960,164; Canada 2,517. |
| Pig iron, including cast iron | 11,795 | 119,141 | United States 85,718; Switzerland 32,091; Brazil 1,064. |
| Sponge iron, powder, shot | 977 | 1,606 | United States 1,220; Sweden 138; France 130. |
| Ferroalloys | 3,115 | 4,419 | United States 3,582; Brazil 315; Republic of South Africa 312. |
| Steel, primary forms | 8,197 | 12,233 | United States 6,764. |
| Semimanufactures [3] | 210,295 | 374,219 | United States 201,743; Canada 44,207; West Germany 26,149. |
| Lead: | | | |
| Oxides | 183 | 90 | United States 15. |
| Metal, including alloys, all forms | 127 | 118 | United States 29; United Kingdom 4. |
| Magnesium metal, including alloys, all forms | 1,655 | 2,791 | United States 2,036; West Germany 355; Norway 250. |
| Manganese: | | | |
| Ore and concentrate, gross weight | 2,789 | 8,342 | Mainly from United States. |
| Oxides | 1,937 | 1,417 | United States 657; Japan 553; Belgium-Luxembourg 201. |
| Mercury 76-pound flasks | 25 | 26 | Netherlands 8; United States 8; West Germany 6. |
| Molybdenum: | | | |
| Ore and concentrate, gross weight | 433 | 522 | United States 423; Canada 63; Chile 33. |
| Metal including alloys, all forms | 6 | 9 | United States 6; West Germany 2. |
| Nickel: | | | |
| Matte, speiss, similar materials | 1,147 | 400 | United States 189; Cuba 94; France 82. |
| Metal including alloys, all forms | 1,241 | 1,613 | United States 1,234; France 84; West Germany 69. |
| Platinum-group metals, all forms: | | | |
| Palladium troy ounces | 6,900 | 6,809 | United States 5,200; Switzerland 994; U.S.S.R. 294. |
| Platinum do | 794 | 848 | United States 675; U.S.S.R. 107; West Germany 60. |
| Other do | 447 | 657 | United Kingdom 354; West Germany 168; United States 102. |
| Rare-earth metals: | | | |
| Oxides and fluorides | 49 | 50 | United States 23; Canada 9; France 8. |
| Metals including alloys kilograms | 26 | 48 | All from United States. |
| Selenium, elemental do | 442 | 3,807 | United States 1,846; Canada 1,222; United Kingdom 800. |
| Silver metal, including alloys troy ounces | 15,071 | 43,111 | Sweden 29,112; United States 11,791; West Germany 1,048. |
| Tantalum metal, all forms kilograms | 26 | -- | |
| Tellurium, elemental do | 192 | 278 | All from United States. |
| Tin: | | | |
| Ore and concentrate, gross weight long tons | 1,455 | 2,963 | United States 2,719; Bolivia 218. Australia 26. |
| Oxides do | 77 | 88 | United Kingdom 61; United States 19; West Germany 7. |
| Metal including alloys, all forms do | 458 | 212 | United States 203. |
| Titanium: | | | |
| Ore and concentrate, gross weight | 1,183 | 1,724 | Australia 1,595; United States 108; West Germany 20. |
| Oxides | 337 | 169 | West Germany 21; United States 1. |
| Slag and residues | 23,411 | 28,379 | All from Canada. |

See footnotes at end of table.

## Table 3—Mexico: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Titanium—Continued | | | |
| Metal, including alloys, all forms | 9 | 22 | Mainly from United States. |
| Tungsten metal, including alloys, all forms | 26 | 37 | Do. |
| Uranium and thorium oxides kilograms | 15 | [3]1 | All from United States. |
| Vanadium pentoxide | 25 | 110 | United States 94; Switzerland 15. |
| Zinc: | | | |
| Oxides | 64 | 44 | United States 41. |
| Metal including alloys, all forms | 134 | 88 | United States 32; West Germany 19; Canada 14. |
| Zirconium ore and concentrate, gross weight | 3,367 | 5,216 | United States 4,302; Australia 913. |
| Other: | | | |
| Ore and concentrate, n.e.s | 302 | 8 | Mainly from United States. |
| Ash and residue containing nonferrous metals | 75 | 100 | United States 92. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | 578 | 735 | United States 657; France 42; West Germany 10. |
| Metals, including alloys, all forms: | | | |
| Metalloids: | | | |
| Phosphorus, elemental (white, black, red) | 18,815 | 19,400 | United States 19,169; Canada 96; United Kingdom 85. |
| Silicon | 639 | 1,059 | United States 405; France 352; United Kingdom 297. |
| Other, n.e.s | 4 | 21 | United States 10. |
| Alkali and alkali earth | 2,981 | 3,355 | United States 3,249. |
| Pyrophoric alloys kilograms | 1,778 | 1,925 | United States 1,270; Austria 100; France 44. |
| Base metals, including alloys, all forms, or n.e.s | 166 | 274 | United States 260; Belgium-Luxembourg 6; West Germany 5. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s. | | | |
| Pumice, emery, natural corundum, etc | 1,153 | 1,659 | United States 1,118; West Germany 109; Netherlands 91. |
| Dust and powder of precious and semiprecious stones, except diamond kilograms | 389 | 14 | Switzerland 9; United Kingdom 3; United States 2. |
| Grinding and polishing wheels and stones | 226 | 177 | United States 121; United Kingdom 24; West Germany 11. |
| Asbestos, crude | 39,448 | 51,400 | Canada 25,814; United States 13,091; Republic of South Africa 7,900. |
| Barite and witherite | 140 | 63 | United States 16. |
| Boron materials: | | | |
| Crude natural borates | 66 | 58 | United States 18; Argentina 10. |
| Oxide and acid | 1,610 | 1,686 | United States 1,623; United Kingdom 50. |
| Bromine | 192 | 200 | United States 108; United Kingdom 5. |
| Cement | 2,609 | 61,699 | United States 4,654; West Germany 979. |
| Chalk kilograms | -- | 182 | Japan 174; United States 8. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Fuller's earth | 537 | 639 | United States 132. |
| Kaolin (china clay) | 28,980 | 34,569 | United States 33,760; United Kingdom 341; Canada 203. |
| Refractory | 96,440 | 111,095 | United States 107,990; France 1,350; United Kingdom 268. |
| Other | 1,283 | 1,949 | United States 1,067. |
| Products: | | | |
| Refractory (including nonclay bricks) | 3,333 | 4,347 | United States 2,394; West Germany 162; France 129. |
| Nonrefractory value, thousands | $317 | $211 | United States $6; Italy $3. |
| Cryolite and chiolite | (4) | 11 | Denmark 3. |
| Diamond: | | | |
| Gem, not set or strung carats | 24,985 | 12,810 | Belgium-Luxembourg 5,490; United States 3,460; Israel 1,490. |
| Industrial thousand carats | 2,040 | 5,200 | United States 4,355; Netherlands 575; Spain 250. |
| Powder do | 405 | 3,065 | United States 1,965; Ireland 80; Belgium-Luxembourg 50. |

See footnotes at end of table.

## Table 3—Mexico: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Diatomite | 156 | 258 | West Germany 20; United States 2. |
| Feldspar and nepheline syenite | 1,902 | 2,724 | United States 2,349; Canada 375. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous [5] | 15,398 | 10,998 | Chile 10,640; United States 358. |
| Phosphatic rock, thousand tons | 1,147 | 1,290 | United States 829; Morocco 432; West Germany 20. |
| Manufactured: | | | |
| Nitrogenous | 248,750 | 218,869 | United States 96,346; Netherlands 42,104; Belgium-Luxembourg 29,978. |
| Phosphatic | 1,519 | 4 | All from United States. |
| Potassic | 82,717 | 98,244 | Mainly from United States. |
| Other, including mixed | 5,137 | 2,361 | Chile 2,093; United States 226; Canada 37. |
| Ammonia | 150,759 | 206,714 | United States 193,261; Australia 11,952. |
| Fluorspar | 4 | 10 | Mainly from West Germany. |
| Graphite, natural | 709 | 294 | United States 238; Canada 55. |
| Gypsum | 20,369 | 28,904 | United States 450; Italy 60; United Kingdom 11. |
| Iodine | 154 | 150 | Chile 77; Japan 39; West Germany 27. |
| Lime | 3,138 | 4,736 | United States 2,440. |
| Magnesite | 952 | 7,066 | Brazil 6,011; United States 1,036. |
| Mica: | | | |
| Crude, including splittings and waste | 213 | 257 | Brazil 204; United States 28; Argentina 22. |
| Worked, including agglomerated splittings | 39 | 28 | United States 25; West Germany 2. |
| Pigments, mineral: | | | |
| Natural, crude | 45 | 18 | United States 3; West Germany 1. |
| Iron oxides, processed | 24 | 84 | United States 80; West Germany 3. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural, kilograms | 360 | 444 | United States 216; West Germany 208. |
| Manufactured, do | 4,558 | 2,492 | Switzerland 1,300; France 1,069; United States 100. |
| Pyrite, unroasted | 9 | 32 | West Germany 25; United States 7. |
| Salt | 640 | 654 | United States 523. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 15,026 | 36,277 | United States 33,749. |
| Caustic potash, sodic and potassic peroxides | 1,385 | 2,002 | United States 1,419; West Germany 469. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 5,897 | 7,085 | Italy 5,393; Guatemala 1,011; United States 177. |
| Worked: | | | |
| Slate | 584 | 692 | Italy 683; Spain 8. |
| Paving and flagstone | 59 | 133 | NA. |
| Other | 5,684 | 6,796 | United States 1,045; Brazil 282; Argentina 126. |
| Dolomite, chiefly refractory grade | 6 | 9 | Mainly from United States. |
| Gravel and crushed rock | 6,574 | 5,287 | United States 3,011; Belgium-Luxembourg 126; Italy 55. |
| Limestone | 55 | -- | |
| Quartz and quartzite | 1,554 | 1,582 | Belgium-Luxembourg 1,180; United States 288; Switzerland 53. |
| Sand, excluding metal bearing | 216,000 | 287,391 | United States 283,077; Canada 1,660; Japan 845. |
| Strontium | 11 | (4) | All from United States. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 333 | 518 | United States 200. |
| Colloidal | 176 | 105 | United States 83; Canada 14; West Germany 3. |
| Sulfur dioxide, kilograms | 233 | 212 | United States 52. |
| Sulfuric acid and oleum | 2,451 | 21,244 | Switzerland 14,850; Venezuela 4,686; United States 554. |
| Talc, steatite, soapstone, pyrophyllite: | | | |
| Pyrophyllite | 269 | 315 | All from United States. |
| Steatite | 80,918 | 89,253 | United States 84,734; Italy 2,686; Canada 1,191. |
| Talc | 210 | 368 | United States 216; Italy 80. |
| Vermiculite | 504 | 591 | United States 405. |

See footnotes at end of table.

## Table 3—Mexico: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Meerschaum, amber, jet kilograms | 26 | | |
| Other do | r 5,651 | 130,028 | Australia 125,830; United States 205. |
| Slag, dross, and similar waste, not metal bearing: | | | |
| From iron and steel manufacture do | 55 | 5,040 | All from United States. |
| Slag and ash, n.e.s do | 20,300 | 93,120 | Mainly from United States. |
| Oxides and hydroxides of magnesium, strontium, and barium | 488 | 533 | United States 457; Canada 51; France 14. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 1,068 | 511 | United States 8. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 701 | 1,013 | All from United States. |
| Carbon black and gas carbon: | | | |
| Carbon black | 1,557 | 2,114 | United States 874; Canada 831; West Germany 174. |
| Gas carbon | 3 | 226 | All from United States. |
| Coal, all grades, including briquets | 388,318 | 237,303 | United States 232,317; Australia 4,810; Canada 154. |
| Coke and semicoke | 132,683 | 140,232 | United States 138,964; Canada 532; Japan 487. |
| Gas, hydrocarbon, natural million cubic feet | 13,890 | 13,621 | All from United States. |
| Hydrogen, helium, rare gases | 898 | 1,172 | United States 176. |
| Peat, including peat briquets and litter | 313 | 838 | All from United States. |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 9,345 | 22,348 | Venezuela 21,192; Ecuador 473; Kuwait 374. |
| Refinery products: | | | |
| Gasoline do | 5,102 | 9,804 | Netherlands Antilles 4,762; United States (including Virgin Islands) 1,654; Venezuela 404. |
| Kerosine do | 102 | 112 | NA. |
| Distillate fuel oil do | 1,478 | 4,591 | United States (including Virgin Islands) 2,064; Netherlands Antilles 965; Venezuela 413. |
| Residual fuel oil do | 1,803 | 1,831 | United States 124. |
| Lubricants do | 197 | 150 | United States 49. |
| Mineral jelly and wax do | 205 | 174 | United States 112; West Germany 24; East Germany 13. |
| Other: | | | |
| Liquefied petroleum gas [6] do | 11,986 | 12,742 | United States (including Virgin Islands) 8,360; Venezuela 2,208; Netherlands Antilles 531. |
| Petroleum coke do | 1,658 | 1,789 | United States 1,753; Bermuda 18; United Kingdom 14. |
| Pitch and pitch coke do | 45 | 86 | United States 83. |
| Bitumen and other residues and bituminous mixtures, n.e.s do | 179 | 269 | United States 30. |
| Unspecified do | 364 | 849 | United States 642; Japan 133. |
| Total do | 23,119 | 32,397 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 15,150 | 18,572 | United States 15,625; West Germany 674; United Kingdom 527. |

r Revised. NA Not available.
[1] Includes free trade materials in totals but excluded in principal sources.
[2] Does not include ingots of high carbon and alloy steel.
[3] Uranium oxide.
[4] Less than ½ unit.
[5] May include a small quantity of manufactured materials.
[6] Includes that derived from natural gas plants.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Alumínio S.A. de C.V., located in Veracruz remained Mexico's only primary aluminum producer. Production of aluminum ingot totaled 40,862 tons, up 4.3% from that of 1973. The plant was reported to be operating at 92.5% of rated capacity. Work proceeded on doubling the plant capacity by 1977. In December, Mexico and Jamaica signed an agreement to establish a joint industrial complex to produce bauxite, alumina, and primary aluminum. The bauxite and alumina plants would be located in Jamaica and would be 51% Jamaican owned. The aluminum plant, with a capacity of 120,000 tons per year of aluminum ingot, would be located in southeastern Mexico and would be 51% Mexican owned.

**Copper.**—Copper mine production increased 3% over that of 1973 to 82,670 tons, whereas refinery production increased 19% to 68,201 tons.

Industria Minera Mexico, S.A. (formerly Asarco Mexicana, S.A.), continued work on the vast La Caridad project in Nacozari, Sonora, where reserves were estimated at 700 million tons grading 0.7% copper. An initial production of 83,000 tons per year was expected by 1976. A new consortium, Cobre de Sonora, S.A., was formed in October to exploit the Santa Rosa and Pilares properties located in Sonora; The Anaconda Company and Phelps Dodge Corp. own a minority interest, with a Mexican majority interest. Comision de Fomento Minera, which owns 13%, encouraged the formation of the consortium. Cobre de Sonora took over Industria Minera's ownership in the La Caridad project late in the year. The Santa Rosa and Pilares properties have ore reserves of 160 million tons grading about 0.8% copper with molybdenum and silver values; the properties should eventually produce 37,000 tons of copper annually. Investment will be about $130 million.[2]

A major copper-mining project was started at Uruapan, Michoacan on the Pacific coast by Minera Cuprifera la Verde, S.A. Ore reserves were estimated at 120 million tons grading 0.7% copper. Lytton Minerals Ltd., jointly owned by Anglo-American Corporation of Canada Ltd. and Hudson Bay Mining & Smelting Company Ltd., hold a 48% interest.

Aerial and geochemical surveys for copper mineralization were underway near San Isidro, Territorio Baja California Norte. In the south, a major copper deposit in the State of Chiapas was officially announced.

A shortage of refinery capacity was a major obstacle to increased copper production. To alleviate the situation, two major electrolytic copper refineries were being planned. Earlier in the year, Industria Minera was planning a complex at San Luis Potosi. Mexicana de Cobre, S.A., was planning a 140,000-ton-per-year refinery at the port of Guaymas, Sonora, for completion in 1978.

The Minister of National Patrimony announced in October that Mexico's copper production should be about 500,000 tons by 1977. This would enable Mexico to reach seventh or eighth place in world copper production.

**Iron.**—The iron and steel industry was growing in both size and sophistication of its facilities. Ore production of 3.3 million tons of iron increased 7% over that of 1973, considerably higher than the 2% increase of 1973 production over that of 1972. Plans called for raising capacity to 9 million tons by 1976 and to 20 million tons by 1984. The value of expansion programs amounted to $80 million.

Privately owned Fundidora Monterrey, S.A., shipped a record high of 1,587,807 tons of iron ore, a 20% increase over that of 1973. Ore was sent by rail to the Fundidora steelworks in Monterrey, Nuevo León from four mining properties. An open pit mine in Durango, 395 miles west of Monterrey, provided 67% of the ore, followed by shipments from the Hercules mine in Coahuila, 350 miles northwest of Monterrey. The Zaniza mine in Oaxaca and the El Mamery mine near Manzanillo, Colima accounted for 4% of the mine production. Fundidora was also involved in a Mexican-French joint venture to establish the first stainless-steel plant in Latin America.

[2] Where necessary, values have been converted from Mexican pesos (Mex$) to U.S. dollars at the rate of Mex$1=U.S.$0.08.

Las Encinas, S.A., an affiliate of Hojalata y Lamina, S.A. (HYLSA), Mexico's second-largest steelmaker, shipped a record high of 1,523,600 tons of iron ore pellets from its Alzada, Colima, plant. This was a 30% increase over 1973 pellet production. The major consumers were HYLSA's two sponge-iron plants at Monterrey, Nuevo León and Puebla, Puebla; together they consumed 71% of the pellet production for 1974.

HYLSA was very active in the research and development of a direct-reduction method for making steel from iron ore. In this process, patented as the HyL process, natural gas is used in place of coal as the reducing agent. The process is particularly significant to countries such as Mexico with small or nonexistent coal resources. Patent rights were sold to Iran, Venezuela, and Indonesia; 12 other countries also expressed interest.

The government-owned Altos Hornos de Mexico, S.A., Mexico's largest steel producer, had an output of 2,359,397 tons of iron ore from its subsidiary, La Perla Minas de Fierro, S.A., in Chihuahua. Pellet production, began in May, amounted to 54,006 tons. This production was from the world's first circular-grate pelletizing system. The plant has an annual capactiy of 600,000 tons of pellets grading 63% iron. The existing heavy-media and jig plant produced 1,898,506 tons of beneficiated ore. All iron-ore products were shipped by rail 114 miles to the Altos Hornos plant at Monclova, Coahuila.

The Las Truchas and Pluton iron deposits are located on the Pacific coast near Melchar Ocampo, Michoacan, and consist mostly of magnetite and hematite. Total reserves of the Las Truchas deposit were estimated at about 130 million tons of ore, and those of the Pluton, at about 42 million tons. Two other ore bodies in the same region have combined reserves of about 50 million tons. All these deposits are relatively close to the Siderúgica Lázaro Cárdenas - Las Truchas, S.A., iron and steel development.

**Lead.**—Lead production increased 22% over that of 1973, and the value increased 64%. Met-Mex Peñoles, S.A., continued work on the first stage of a $32 million improvement to its lead-ore sintering and refining plant at Torreon, Coahuila. The improvements will include a new sintering machine for lead ore and concentrate, a sulfuric acid plant, new smelting furnaces, and a new lead-silver refining plant with a capacity of 190,000 tons of lead bullion annually. Completion of the first stage was scheduled for mid-1975. Because of the large capacity of the plant, long-term contracts for the processing of 100,000 tons per year of lead concentrate were signed with Minero Peru, S.A., and C. Tennant Sons & Company Ltd. Processing of lead concentrate was scheduled to begin in July 1975.

Industria Minera, S.A., was modernizing its lead smelter in Chihuahua to increase its capacity to 130,000 tons per year by yearend 1975.

**Manganese.**—Production of manganese increased 11% from that of 1973. Cía. Minera Autlan, S.A., Mexico's most important manganese producer, was spending $4 million on its manganese properties at Molango, Hidalgo to increase production 30% by 1976. The company continued construction of its 50,000-ton-per-year plant at Tamos, Veracruz, at a cost of $30.4 million.

**Silver.**—Mexican silver production declined 3% from that of 1973. However, several new projects were underway that could result in Mexico's becoming the world's leading silver producer. Projects underway in 1974 by Industrias Peñoles, S.A., Mexico's largest producer, could provide an additional 20 million troy ounces of silver per year.

A $50 million development of one of the world's richest silver mines at Las Torres near Guanajuato was near completion. Peak annual production at the mine should reach 7 million troy ounces of silver and 40,000 troy ounces of gold. Drill holes showed reserves of at least 2.1 million tons of ore averaging 500 grams per ton in silver and 0.8 gram per ton in gold. Sinking the shafts was essentially completed and work on the mill was progressing well. The development stage of the 1.5-million-troy-ounce-per-year Lampozos mine in Sonora was completed. Throughout the country, expansion of lead and zinc mines in which silver is a coproduct is expected to provide an additional 8 million to 9 million troy ounces per year of silver.

The Canadian joint venture between Avino Mines & Resources, Ltd., and the

Pat Sheridan Group of Toronto, Ltd., began production at its silver-copper mine 60 miles north of Durango, Durango. The concentrating plant has a capacity of 500 tons per day.

**Uranium.**—A small mill was under construction at the beginning of the year at the El Nepal mine in the State of Chihuahua. This mill was designed to be mobile and will provide the nuclear fuel for the 650-megawatt Laguna Verde nuclear powerplant located near Alto Lucero, Veracruz. Reserves were established at about 4,000 tons of $U_3O_8$, up substantially from previous estimates.

**Zinc.**—Mexican zinc production declined 3% from that of 1973, Industria Minera Mexico, S.A., planned to commit a major share of its $160 million investment to integration of its zinc operations. The company slated $96 million for a 110,000-ton-per-year electrolytic zinc refinery to be completed in 1976 at San Luis Potosi, San Luis Potosi. This added capacity would bring Mexico's zinc-refining capacity to 300,000 tons, sufficient to smelt its zinc mine production. The plant, which uses a continuous leaching process, will have an annual capacity of 900 tons of cadmium and 130,000 tons of sulfuric acid. Industria Minera also installed a 2,200-ton-per-day mill at its Taxco, Guerrero, silver-lead-zinc mine. At the San Martin mine in Zacatecas, facilities were being expanded to double production of silver, zinc, and copper by 1976.

## NONMETALS

**Cement.**—Cement production in Mexico rose to a record high in 1974 with output totaling 10.5 million tons, up 8.2% from that of 1973. The largest production was from the Federal District and Nuevo León. This was a reflection of increased activity in the construction industry as well as a 3.7% increase in cement-making capacity. Early in the year, the Mexican cement industry compiled statistics that indicated that production would double by 1982.

Cemento Apasco, S.A., completed installation of a new 2,000-ton-per-day kiln. Cruz Azul, S.C.L., was in the midst of major expansion projects at its plants in Jasso, Hidalgo, and Laguna, Oaxaca. When completed in 1975, the expansion will increase capacity by 3,500 tons per day. Cementos del Pacífico, S.A., had a 2,000-ton-per-day plant under construction at Marmol, Sinaloa; Cementos Mexicanos, S.A., completed a 1,200-ton-per-day expansion at its Monterrey, Nuevo León plant; Cementos Veracruz, S.A., was increasing its capacity by 1,200 tons per day through the installation of a new kiln at its Orizaba plant; and Cementos Anahuac de Golfo, S.A., was expanding capacity at its Tamuiun, San Luis Potosi plant by an additional 3,000 tons per day by mid-1975.

**Fluorspar.**—Mexico was the world's largest producer and exporter of fluorspar in 1974. Production rose 2% over that of 1973 and comprised almost one-third of the total world production of fluorspar. Mexico exported most of its fluorspar, providing about 75% of U.S. requirements. Fluorspar exports accounted for 10% of the total value of Mexico's mineral exports.

Late in the year, Mexican producers won a 28% increase in price for fluorspar, largely through the efforts of the Mexican Fluorspar Institute, a trade association organized late in the year.

Minera Frisco, S.A., commissioned a flotation mill with an annual capacity of 70,000 tons at San Francisco del Oro, Chihuahua. The mill output fed the Matamoros hydrofluoric acid plant started by Quimica Fluor, S.A., near yearend.

**Phosphate Rock.**—Guanos y Fertilizanzantes, S.A., the government-owned fertilizer plant at Coatzacoalos, Veracruz announced the exploitation of phosphate rock in the State of Hidalgo. Imports of phosphate rock from Florida and Morocco had been supplying the plant. The Hidalgo deposits of 35% $P_2O_5$ assure Mexico of self-sufficiency in phosphate. New reserves of up to 3 billion tons of crude phosphate rock discovered in Baja California Sur may induce Mexico to become an exporter of the mineral product.

**Sulfur.**—Sulfur production increased 44.4%. Desulfurization plants operating in conjunction with petroleum refineries were contributing about 5% of the country's total sulfur production.

## MINERAL FUELS

**Petroleum.**—Petróleos Mexicanos, S.A. (Pemex), the government-owned organization with exclusive control over the Mexican petroleum industry, produced 27.3%

more crude oil than in 1973. This compares with an increase of 2.2% registered in the previous year. The increased production was due largely to the development of oilfields in southeastern Mexico. During the second half of 1974, Mexico reentered the crude oil export market. The total value of all petroleum exports amounted to about $120 million, almost four times the 1973 value. Pemex was able to reduce its volume of imports to about 26.5 million barrels, about one-half the imports for 1973. Mexico ceased importing crude oil by the fourth quarter.

The focal point of Mexican petroleum production is the Reforma area in the southern States of Chiapas and Tabasco. The Sitia Grande and Cactus Fields were the most important producers. By yearend, about 276,000 barrels per day, or 41% of Mexican oil production, was coming from the 54 wells of this area. Mexico's total hydrocarbon reserves during 1974 increased by 341 million barrels to a yearend total of 5,573 million barrels.

Pemex investments in diverse projects amounted to $779 million, 36% greater than in 1973. An additional 176 projects representing a total investment of almost $2 billion were under construction. At the Cactus Field, Pemex was constructing a 115-cubic-foot-per-day sour-gas treatment plant. Three other plants were in a construction or engineering-design phase. The combined daily capacity of all four plants will be 600 million cubic feet of gas and 480 tons of sulfur. At the same site, a 200,000-barrel-capacity oil tank was completed and two 55,000-gallon tanks were under construction. It was also announced that construction would begin on a cryogenic propane and ethane plant in 1976.

The recent discoveries in the Chiapas-Tabasco region represented less than one-third of the potential oil-producing area of Mexico. Pemex was also enthusiastic about the hydrocarbon reserve prospects at San Sebastian Vizcaina near Guerrero Negro in Baja California Sur, in the Papaloapan Basin, and off the coast of Campeche.

Mexico was considering joining the Organization of Petroleum Exporting Countries (OPEC), but no firm decision was made in 1974. However, Mexico did honor the OPEC price. Mexico's position as a petroleum exporter was an important factor in effecting a more favorable balance of trade for the country.

# The Mineral Industry of Morocco

By W. F. Stowasser [1]

Although 1974 was a good mineral production year for Morocco, principally caused by a strong international demand for phosphate rock and another large increase in phosphate rock selling prices, it appeared there would be a softening of demand in the commodity markets in the first half of 1975, not only for phosphate rock but also for lead and copper. It is probable that stocks of Moroccan phosphate rock and metal concentrates will increase in 1975 as world demand for these commodities declines.

The Office Cherifien des Phosphates (OCP), after increasing the price of 75% bone phosphate of lime (BPL) phosphate rock in 1973 from $14 to $42 [2] per ton, raised the price of equivalent grade rock to $68 per ton on January 1, 1975, free-along-side (f.a.s.) Casablanca or Safi. The rationale for these rapid price increases was that phosphate rock was undervalued on the world market and that exports of phosphate rock were not generating sufficient revenue to permit the buildup of a broadly based economy. As a result, revenues from phosphate rock exports in 1974 increased 486% over those of 1973. It is not probable that a rise of this order in revenues will occur in 1975.

Shipments to Asia and Western Europe declined in the first half of 1975. A combination of factors that include wet weather, buyer resistance to selling prices, and the higher cost of petroleum imports was responsible for the decline in exports in early 1975. The world supply of phosphate rock, responding to 1974 price levels, increased, creating additional competition for Moroccan phosphate rock exports. Phosphates in 1974 represented 90.8% of the total mineral revenues of Morocco, 55% of the total export receipts, and about 20% of the gross national product.[3] The 5-year plan depends on these revenues to finance growth in other sectors as well as expand the phosphate mines, plants, and fertilizer plants. Investments were planned, based on continuing high revenues from phosphate rock exports, to increase production to over 50 million tons per year in the mid-1980's.

There were no announced changes in current government minerals policy, with the exception of the plan announced in November 1973 to extend phosphate credits to developing countries. This plan, to become effective with the new contract cycle in July 1975, will return half of the proceeds of the sales of phosphate rock to developing countries in the form of long-term loans at low rates of interest, or in the form of investments in the processing industries of those countries. Only Bangladesh, India, and Mexico, in this category, purchase significant quantities of rock from Morocco.

To stimulate growth in the mineral sector, the scheduled public sector outlay, under the 5-year plan was $91 million. Of this total, about $14.2 million will be used to finance basic geological studies with emphasis on petroleum exploration. There was no formal revision of this allocation for 1975 despite several official press releases promising "whatever is necessary" to promote desperately needed petroleum production. Faced with increasing costs of imported petroleum, more may be expended than was originally planned. Over and above the public sector outlays, the plan projects private and bank investments of $210 million for an estimated total of public and private investment of $300 million during the 5-year plan period.

[1] Physical Scientist, Division of Nonmetallic Minerals.

[2] Where necessary, values have been converted from Moroccan Dirhams (DH) to U.S. dollars at the rate of DH3.80=US$1.00.

[3] U.S. Embassy, Rabat, Morocco. Department of State Airgram A-85, July 9, 1975, p. 2.

The government-controlled Bureau de Recherches et de Participations Minières (BRPM) is Morocco's chief mining operator in the nonphosphate field. BRPM currently participates in more than 24 mines and, in addition, is involved in the search for both minerals and petroleum.

Moroccan investment policy related to mining remained unchanged during 1974, with one exception. The distribution of refined petroleum products was subjected to the "Moroccanization" laws and the government-owned Société Nationale des Produits Pétrolieres (SNPP) has more than 50% control. With this exception and OCP's phosphate monopoly, minerals production and marketing are controlled by the Investment Code of August 1973.

## PRODUCTION

Moroccan mineral production, excluding water, natural gas, and crude oil, increased from 20.6 million tons in 1973 to 24.4 million tons in 1974, a gain of 19%. Phosphate rock production increased from 17.1 million tons in 1973 to 19.7 million tons in 1974; this 2.6-million-ton increase accounted for most of the 3.8-million-ton increase for the country. The increase in phosphate rock prices during 1974 for both Khouribga and Youssoufia production was 62% for all grades. The increase in phosphate rock exports, coupled with the price advance in 1974, increased Morocco's income and represented 90.8% of the total mineral revenue.

Mineral production other than phosphates was mixed in 1974. Although production increased for several important minerals, with gains registered for iron ore, copper, and manganese, production decreased for lead, zinc, crude oil, and natural gas.

**Table 1.—Morocco: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Antimony concentrate: | | | |
| Gross weight | 2,008 | 2,698 | 4,282 |
| Metal content | 832 | 1,133 | 2,141 |
| Cobalt concentrate: | | | |
| Gross weight | 11,444 | 10,157 | 12,518 |
| Metal content | 1,602 | 1,422 | 1,627 |
| Copper concentrate: | | | |
| Gross weight | 13,528 | 14,660 | 16,504 |
| Metal content | [r] 3,828 | 4,251 | 4,951 |
| Iron and steel: | | | |
| Iron ore, direct shipping, gross weight | [r] 233,180 | 374,149 | 531,287 |
| Pig iron [e] | 10,000 | 10,000 | 10,000 |
| Steel [e] | 1,000 | 1,000 | 1,000 |
| Lead concentrate: | | | |
| Gross weight | 146,282 | 158,830 | 141,430 |
| Metal content | [r] 86,306 | 108,004 | 96,172 |
| Manganese ore, chemical grade | 96,067 | 146,149 | 174,781 |
| Nickel content of cobalt ore | 200 | [e] 200 | [e] 400 |
| Silver: | | | |
| From Imiter operation thousand troy ounces | 878 | 818 | 787 |
| Content of exported lead concentrate do | 2,498 | [e] 2,700 | [e] 2,400 |
| Total do | 3,376 | [e] 3,518 | [e] 3,137 |
| Tin: | | | |
| Concentrate: | | | |
| Gross weight long tons | 12 | 15 | 4 |
| Metal content do | 8 | 10 | 3 |
| Smelter, primary do | 12 | 12 | 12 |
| Zinc concentrate: | | | |
| Gross weight | 36,417 | 32,677 | 27,354 |
| Metal content | 19,500 | 18,299 | 18,000 |
| **NONMETALS** | | | |
| Barite | 93,240 | 102,691 | 93,381 |
| Cement, hydraulic thousand tons | 1,542 | 1,619 | 1,914 |
| Clays, crude: | | | |
| Bentonite | 8,700 | 5,729 | NA |
| Smectite | 15,438 | 19,122 | 20,094 |
| Other, including fuller's earth | 7,050 | 5,630 | 4,343 |

See footnote at end of table.

## Table 1.—Morocco: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Fertilizer materials, crude, natural, phosphate rock | thousand tons | [r] 15,105 | 17,077 | 19,721 |
| Fluorspar | | | -- | 19,050 |
| Goethite | | 25 | 36 | 24 |
| Mineral water | | 14,215 | 16,869 | 16,874 |
| Pyrite and pyrrhotite: | | | | |
| Gross weight | | 430,006 | 407,098 | 508,787 |
| Sulfur content | | 133,301 | 134,399 | 157,724 |
| Salt, all types | | 45,508 | 27,601 | 36,054 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Coal, anthracite | thousand tons | 547 | 565 | 574 |
| Fuel briquets | do | 17 | 9 | 660 |
| Gas, natural: | | | | |
| Gross production | million cubic feet | 1,822 | 2,302 | 2,081 |
| Marketed | do | 1,763 | 2,221 | 1,991 |
| Petroleum: | | | | |
| Crude oil | thousand 42-gallon barrels | 216 | 320 | 191 |
| Refinery products: | | | | |
| Gasoline | do | 2,968 | 3,142 | |
| Jet fuel | do | 541 | 618 | |
| Kerosine | do | 508 | 627 | |
| Distillate fuel oil | do | 3,983 | 4,898 | NA |
| Residual fuel oil | do | 4,628 | 5,271 | |
| Other | do | 648 | 1,584 | |
| Refinery fuel and losses | do | 1,299 | 829 | |
| Total | do | 14,575 | 16,969 | NA |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, Morocco also produces manufactured phosphatic fertilizers and a variety of crude construction materials, but available information is inadequate to make reliable estimates of output levels.

## Table 2.—Morocco: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, all forms | [r] 574 | 601 | France 364; Italy 89; Spain 82. |
| Antimony ore and concentrate | 3,302 | 2,796 | France 995; Spain 570; Belgium-Luxembourg 564. |
| Cobalt concentrate | 12,606 | 10,549 | France 8,549; People's Republic of China 2,000. |
| Copper: | | | |
| Ore and concentrate | 13,598 | 14,319 | Belgium-Luxembourg 5,508; West Germany 4,461; People's Republic of China 2,000. |
| Metal including alloys, all forms | 1,077 | 1,146 | West Germany 458; Spain 241; Italy 177. |
| Gold, waste and sweepings troy ounces | -- | 96,163 | All to France. |
| Iron and steel: | | | |
| Roasted pyrite | 308,210 | 490,085 | West Germany 333,227; United Kingdom 46,088; Spain 44,100. |
| Metal: | | | |
| Scrap | [r] 34,866 | 61,016 | Spain 44,861; Italy 14,645; West Germany 950. |
| Ferroalloys, ferronickel | 66 | -- | |
| Semimanufactures | [r] 25 | 30 | Ivory Coast 17; Sierra Leone 9; ship stores 3. |
| Lead ore and concentrate | 138,194 | 136,144 | France 40,542; Spain 29,373; Tunisia 18,441. |
| Magnesium metal including alloys, all forms | -- | 10 | All to Italy. |
| Manganese ore and concentrate | 117,693 | 115,108 | United States 36,574; Netherlands 34,140; France 26,731. |
| Nickel metal including alloys, all forms | -- | 80 | All to France. |
| Silver metal including alloys thousand troy ounces | 67,483 | 895 | Switzerland 545; Belgium-Luxembourg 212; United Kingdom 138. |
| Titanium oxide kilograms | -- | 200 | All to France. |
| Zinc: | | | |
| Ore and concentrate | 21,649 | 26,195 | France 11,251; Belgium-Luxembourg 9,831; West Germany 4,313. |

## Table 2.—Morocco: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Zinc—Continued | | | |
| Oxide | 2,495 | 6,705 | All to Norway. |
| Metal including alloys, all forms | 78 | 57 | All to France. |
| Other: | | | |
| Ore and concentrate | 18,055 | 26,201 | United Kingdom 15,858; France 10,333. |
| Ash and residue containing nonferrous metals | r 3,025 | 524 | France 229; Tunisia 216; Belgium-Luxembourg 46. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | r 5 | 5 | Algeria 3; Libya 1; France 1. |
| NONMETALS | | | |
| Barite and witherite | 84,934 | 94,159 | United Kingdom 53,594; United States 37,250; France 2,270. |
| Boron materials, crude natural | 8 | -- | |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 1,139 | 567 | Spain 347; United Kingdom 220. |
| Fire clay | 14,167 | 5,182 | NA. |
| Fuller's earth | r 14,055 | 14,808 | Spain 10,836; Tunisia 2,986; Algeria 953. |
| Other | 180 | -- | |
| Products: | | | |
| Refractory (including nonclay bricks) | 5,415 | 5,768 | Tunisia 1,012; Lebanon 849; Arab Republic of Egypt 794. |
| Nonrefractory | 51 | 133 | Gibraltar 61; Senegal 56; Algeria 14. |
| Feldspar, leucite, nepheline | r 3 | -- | |
| Fertilizer materials: | | | |
| Crude, phosphatic - thousand tons | 13,581 | 16,102 | France 1,783; Spain 1,637; United Kingdom 1,452. |
| Manufactured: | | | |
| Nitrogenous | 1,400 | 4,300 | All to France. |
| Phosphatic | 260,318 | 261,708 | Brazil 43,435; Hungary 30,002; Yugoslavia 30,000. |
| Other, including mixed | 4,951 | -- | |
| Gypsum and plasters | r 132,104 | 206,555 | Nigeria 62,887; Japan 39,615; Portugal 30,850. |
| Lime | 110 | 129 | Gibraltar 11. |
| Mica, all forms | -- | 165 | All to United Kingdom. |
| Pigments, mineral, including processed iron oxides | 25 | 51 | Mainly to France. |
| Precious and semiprecious stones, natural and manufactured kilograms | r 557 | 8,599 | Belgium-Luxembourg 7,840; West Germany 710; Libya 25. |
| Pyrite (gross weight) | 530 | -- | |
| Salt and brine | (1) | -- | |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | r 3,934 | 4,359 | Mainly to Italy. |
| Worked | 440 | 325 | United Kingdom 16; West Germany 12; Switzerland 11. |
| Gravel and crushed rock | r 51,495 | 34,555 | Gibraltar 570; West Germany 1. |
| Quartz and quartzite | 204 | (1) | All to West Germany. |
| Sand, excluding metal bearing | 56,741 | 79,997 | NA. |
| Sulfur, elemental, all forms | 1,359 | 64 | NA. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Vermiculite, perlite, chlorite | 9 | -- | |
| Unspecified | 3 | 171 | Mainly to Gibraltar. |
| Slag, dross, and similar waste, not metal bearing | 500 | 288 | NA. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 2,522 | 4,134 | Liberia 2,243; Nigeria 1,281; Ivory Coast 278. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal, all grades, including briquets | 21,185 | 30,690 | Algeria 12,211; Italy 10,509; Romania 3,160. |
| Petroleum refinery products: | | | |
| Gasoline 42-gallon barrels | 804 | 415,932 | Mainly to Netherlands. |
| Kerosine and jet fuel do | 55,930 | 75,360 | Netherlands 49,184; ship stores 26,176. |

See footnotes at end of table.

## Table 2.—Morocco: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum refinery products—Continued | | | |
| Distillate fuel oil, 42-gallon barrels | 57,098 | 161,505 | Mainly to West Germany. |
| Residual fuel oil ---------- do | 5,266 | 8,228 | All to ship stores. |
| Lubricants ---------- do | r 2,405 | 4,128 | Ship stores 2,775; United States 1,344; Gabon 5. |
| Other: | | | |
| Liquefied petroleum gas, do | 1,160 | 1,169 | All to Gibraltar. |
| Mineral jelly and wax do | 40 | -- | |
| Bitumen and other residues, do | 61 | -- | |
| Bituminous mixtures, n.e.s., do | 4 | -- | |
| Unspecified ---------- do | r 590 | 45,586 | Mainly to Netherlands. |

r Revised. NA Not available.
1 Less than ½ unit.

## Table 3.—Morocco: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum: | | |
| Bauxite and concentrate | 1,200 | (1) |
| Oxide and hydroxide | 726 | 929 |
| Metal including alloys, all forms | r 3,332 | 3,828 |
| Antimony metal including alloys, all forms | 15 | 36 |
| Arsenic trioxide, pentoxide acids | 25 | 13 |
| Bismuth metal including alloys, all forms ---------- kilograms | 215 | 197 |
| Cadmium metal including alloys all forms ---------- do | 277 | 500 |
| Chromium: | | |
| Chromite | 23 | -- |
| Oxide and hydroxide | 20 | 6 |
| Metal including alloys, all forms ---------- kilograms | 85 | 15 |
| Cobalt: | | |
| Oxide and hydroxide ---------- do | 23 | 14 |
| Metal including alloys, all forms ---------- do | 95 | 38 |
| Copper: | | |
| Copper sulfate | (1) | 6 |
| Metal including alloys, all forms | 3,652 | 4,163 |
| Gold metal, unworked or partly worked ---------- troy ounces | r 48,454 | 14,147 |
| Iron and steel: | | |
| Roasted pyrite | 3,755 | 3,080 |
| Metal: | | |
| Scrap | 431 | 28 |
| Pig iron, including cast iron | 1,499 | 2,067 |
| Sponge iron, powder, and shot | 42 | 85 |
| Ferroalloys | 244 | 296 |
| Steel, primary forms | 8,347 | 8,097 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections | 170,095 | 187,986 |
| Universals, plates, sheets | 88,821 | 90,678 |
| Hoop and strip | 9,377 | 9,879 |
| Rails and accessories | 1,051 | 1,830 |
| Wire | 8,729 | 11,099 |
| Tubes, pipes, fittings | 19,461 | 19,111 |
| Castings and forgings, rough | 177 | 154 |
| Lead: | | |
| Oxides | 318 | 253 |
| Metal including alloys: | | |
| Scrap | -- | 2 |
| Unwrought | 1,861 | 2,398 |
| Semimanufactures | r 110 | 74 |
| Magnesium metal including alloys, all forms ---------- kilograms | 102 | 95 |
| Manganese: | | |
| Ore and concentrate | 52 | 28 |
| Oxides | 102 | 56 |
| Mercury ---------- 76-pound flasks | 98 | 74 |
| Molybdenum metal including alloys, all forms ---------- kilograms | 50 | 213 |
| Nickel: | | |
| Matte, speiss, and similar materials | 1 | -- |
| Metal including alloys: | | |
| Scrap | -- | 2 |
| Unwrought | 5 | 5 |
| Semimanufactures | 803 | 506 |

See footnotes at end of table.

## Table 3.—Morocco: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS—Continued | | |
| Platinum-group metals including alloys ____ troy ounces | 129 | 9 |
| Selenium, elemental ____ kilograms | 202 | 109 |
| Silver metal including alloys ____ thousand troy ounces | r 21,329 | 5,582 |
| Tin metal including alloys, all forms ____ long tons | 399 | 351 |
| Titanium: | | |
| Oxides | 865 | 1,014 |
| Metal including alloys, all forms ____ kilograms | 56 | 35 |
| Tungsten metal including alloys, all forms ____ do | 25 | 34 |
| Zinc: | | |
| Oxide | 596 | 570 |
| Metal including alloys: | | |
| Scrap | -- | 100 |
| Blue powder | 55 | 49 |
| Unwrought | r 1,873 | 1,887 |
| Semimanufactures | 180 | 239 |
| Other: | | |
| Ore and concentrate | 3 | (1) |
| Oxides, hydroxides, and peroxides of metals, n.e.s | 17 | 14 |
| Metals including alloys, all forms: | | |
| Metalloids | 6 | 13 |
| Alakli, alkaline earth, rare-earth metals | 1 | 6 |
| Pyrophoric alloys ____ kilograms | 156 | 184 |
| Base metals including alloys, all forms, n.e.s ____ do | 19 | 8 |
| NONMETALS | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | 24 | 17 |
| Grinding and polishing wheels and stones | 223 | 273 |
| Asbestos | 3,145 | 3,400 |
| Barite | 4 | 2 |
| Boron materials: | | |
| Crude natural borates | 1,600 | 30 |
| Oxide and acid | 12 | 6 |
| Bromine ____ kilograms | 221 | 166 |
| Cement | 77,859 | 45,437 |
| Chalk | 3,422 | 3,784 |
| Clays and clay products (including all refractory brick): | | |
| Crude clays, n.e.s.: | | |
| Fire clay | 9,410 | 11,921 |
| Fuller's earth | r 2,000 | 500 |
| Kaolin (china clay) | 3,050 | 3,904 |
| Other | r 857 | 156 |
| Products: | | |
| Refractory (including nonclay bricks) | 1,529 | 1,964 |
| Nonrefractory | 5,682 | 4,456 |
| Cryolite and chiolite ____ kilograms | -- | 2 |
| Diamond, industrial ____ carats | -- | 2,000 |
| Diatomite and other infusorial earth | 321 | 360 |
| Feldspar, leucite, and nepheline | 25 | 179 |
| Fertilizer materials, crude and manufactured: | | |
| Nitrogenous | 123,742 | 177,316 |
| Phosphatic | (1) | (1) |
| Potassic | r 43,680 | 39,361 |
| Other, including mixed | 134 | 57 |
| Fluorspar | 681 | 10 |
| Graphite, natural | r 22 | 12 |
| Gypsum and plasters | (1) | -- |
| Iodine ____ kilograms | 142 | 201 |
| Lime | 225 | 3,855 |
| Magnesite | 328 | 322 |
| Mica: | | |
| Crude, including splittings and waste | 20 | 26 |
| Worked, including agglomerated splittings | 2 | 1 |
| Pigments, mineral: | | |
| Natural, crude | 446 | 236 |
| Iron oxides, processed | 541 | 522 |
| Precious and semiprecious stones, natural and manufactured ____ kilograms | 434 | 347 |
| Pyrite (gross weight) | r 3 | -- |
| Salt | 7,740 | 9,492 |
| Sodium and potassium compounds, n.e.s | 11,515 | 12,752 |
| Stone, sand and gravel: | | |
| Dimension stone | r 619 | 647 |
| Dolomite, chiefly refractory grade | 1,374 | 1,299 |
| Gravel and crushed rock | 44 | 24 |
| Quartz and quartzite | 65 | 9 |
| Quartz, electronic grade ____ grams | -- | 900 |
| Sand, excluding metal bearing | 18,498 | 16,899 |

See footnotes at end of table.

**Table 3.—Morocco: Imports of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| NONMETALS—Continued | | |
| Sulfur: | | |
| Elemental, all forms | r 36,815 | 35,056 |
| Sulfur dioxide | 162 | 105 |
| Sulfuric acid | 5,051 | 130,263 |
| Talc, steatite, soapstone, pyrophyllite | 1,164 | 1,334 |
| Other nonmetals, n.e.s.: | | |
| Crude: | | |
| Vermiculite, perlite, chlorite | 79 | 2 |
| Unspecified | 516 | 511 |
| Oxides and hydroxides of magnesium, strontium, barium | 10 | 16 |
| Fluorine | -- | 8 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Asphalt and bitumen, natural | 2 | 6 |
| Carbon black and gas carbon | 2,579 | 2,902 |
| Coal and coke, including briquets | 52,401 | 38,488 |
| Hydrogen, helium, and rare gases | 9 | 8 |
| Peat, including peat briquets and litter | 522 | 100 |
| Petroleum: | | |
| Crude thousand 42-gallon barrels | 13,082 | 16,938 |
| Refinery products: | | |
| Gasoline do | r 24 | 18 |
| Kerosine do | 246 | 102 |
| Distillate fuel oil do | r 620 | 93 |
| Residual fuel oil do | r 618 | 455 |
| Lubricants do | r 197 | 224 |
| Other: | | |
| Liquefied petroleum gas do | 649 | 759 |
| White spirit do | 33 | 28 |
| Mineral jelly and wax do | 130 | 164 |
| Nonlubricating oils, n.e.s do | 4 | 6 |
| Bitumen and other residues do | 5 | 1 |
| Bituminous mixtures, n.e.s do | 1 | (1) |
| Pitch, pitch coke, petroleum coke do | 10 | (1) |
| Unspecified do | r 25 | 32 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | r 813 | 716 |

r Revised.
1 Less than ½ unit.

## TRADE

The principal commodity exported from Morocco was phosphate rock. Exports increased from 13.6 million tons in 1972 to 16.1 million tons in 1973, and to 18.9 million tons in 1974 The destinations of significance in 1974 were Belgium 1.5 million tons, France 2.4 million tons, Italy 1.4 million tons, the United Kingdom 1.5 million tons, Poland 1.7 million tons, and Spain 1.1 million tons. Exports of copper concentrate increased modestly from 13,598 tons in 1972 to 14,319 tons in 1973. Exports of lead concentrate declined slightly from 138,194 tons in 1972 to 136,144 tons in 1973. Shipments of zinc concentrate increased from 21,649 tons in 1972 to 26,195 tons in 1973. France, Belgium-Luxembourg, and West Germany received most of this mineral. Exports of silver declined markedly from 67,483,000 troy ounces in 1972 to 895,000 troy ounces in 1973.

Exports of barite and witherite increased from 84,934 tons in 1972 to 94,159 tons in 1973. Shipments were made to the United Kingdom, the United States, and France. Increases in exports of fuller's earth, refractory bricks, nitrogenous and phosphatic fertilizers, gypsum and plasters were noted in 1973. A significant increase in exports of precious and semiprecious stones to Belgium-Luxembourg, West Germany, and Libya developed in 1973 when 8,599 kilograms were reported, compared with only 557 kilograms in 1972. Exports of dimension stone, sand, and other building materials increased in 1973. Exports of sulfur, gravel, and crushed rock declined in 1973.

Export revenues increased for nonphosphate minerals by 40% over those of 1973. There were indications in the second half of 1974 that several of these export markets were reflecting a softening of demand. It is probable that expansion plans will be deferred and stockpiles will grow in 1975.

The largest tonnages of imports in 1973 were steel shapes.

## COMMODITY REVIEW

### METALS

**Copper.**—The 5-year plan projected a threefold rise in copper production by 1977. This goal probably will not be achieved because revenues have not been adequate to finance the expansions. Production of copper concentrate increased from 14,660 tons in 1973 to 16,504 tons in 1974, a 13% gain. This was much less than the 28,000 tons forecast for 1974. The expansion plans for new copper washing plants at both Ouansimi and Tazallaght did not materialize. Production from the largest Moroccan copper mine at Bou Skour did increase and unit extraction costs declined. The production increase in 1974 was justified with a favorable contract. It is probable that the market will not support the current production level from this mine. Although the open pit mine at Ouaouizerte has low production costs, output has been curtailed because of the weak international market. The investment in the 30,000-ton-per-year copper foundry was continuing on schedule.

**Iron Ore.**—The BRPM-owned Société d'Exploitation des Mines du Rif (SEFERIF) pelletizing plant near Nador increased production from 374,149 tons in 1973 to 531,287 tons in 1974. Although this was a 42% increase, the rated capacity of the plant, 850,000 tons, will not be reached until 1976. Present production is exported to Europe. Plans for a steel mill and a new port at Nador are scheduled, and construction will start before 1977. Exports of iron ore pellets will decline after the mill is operational.

**Lead.**—Production of lead concentrate decreased 11% in 1974, compared with production in 1973. The production decline from 158,830 to 141,430 tons was attributed to reduced output from mines at Touissit and Aouli and a prolonged strike at Aoum. The largest mine at Zeïda in the province of Meknès produced 40,000 tons of concentrate in 1974, about the same as that produced in 1973. If world demand increases, this mine could produce additional lead concentrate for the export market. Production of lead concentrate was expected to increase in 1975 to supply the export market and the modernized lead foundry at Oued el Heimer. The projected capacity of the foundry was 35,000 tons of lead and 27 tons of silver per year. This plant will be supplied by the Touissit mine. A new lead foundry was planned at Meknès to utilize the production of several small mines in the area.

**Manganese.**—Production of chemical-grade manganese ore increased from 146,149 tons in 1973 to 174,781 tons in 1974. The 20% increase was obtained from the Imini mine operated by the French-BRPM firm Société Anonyme Chérifienne d'Etudes Minières (SACEM). With proven reserves of 1.5 million tons, production may well increase substantially in 1975, if world demand and prices continue at current levels. The United States is the largest importer of Moroccan manganese ore and Western Europe consumes most of the balance. Eventually, a new mill will be constructed near Quarzazate.

**Zinc.**—The production decline of zinc concentrate from 32,677 tons in 1973 to 27,354 tons in 1974 reflects depletion of reserves at operating mines. Although new zinc deposits have been discovered in scattered areas, and deeper mineralized zones are known to exist, it is not clear if BRPM will act to increase production of zinc in a market with declining demand.

### NONMETALS

**Fluorspar.**—Production from the El Hamman deposit in central Morocco started in 1974 with a reported 19,050 tons of 50% $CaF_2$ ore. It is planned to expand the mine and mill to 80,000 tons per year of 50% $CaF_2$ ore and 60,000 tons per year of 98% $CaF_2$ ore. The reserve is of the order of 5 million tons.

**Phosphate Rock.**—Morocco produced 19,721,000 tons in 1974, an increase of 15% over that reported in 1973. Most of Morocco's production was exported to Western Europe, Eastern Europe, and Asia. Morocco exported 18.7 million tons of phosphate rock in 1974, an increase of 16% over that of 1973. Morocco was the world's leading exporter of phosphate rock. Deliveries to Western Europe in 1974 were 11.2 million tons, while 4.6 million tons went to Eastern Europe, 1.3 million tons to South America, and 1.2 million tons to Asia. The rate of shipments to Western Europe started to slow toward the latter part of 1974. Shipments to both the People's Republic of China (PRC) and Spain were each about 0.5 million tons less than in 1973. France, Poland, and Romania together received more than the drop in exports to PRC and Spain.

The price of Moroccan phosphate rock was increased significantly in January and July of 1974, and to a lesser degree on January 1, 1975. Export price increases by grade and mining area in $US per metric ton f.a.s. Casablanca or Safi, are shown in the following tabulation:

| Grade percent BPL | January 1974 | July 1974 | January 1975 |
|---|---|---|---|
| Khouribga: | | | |
| 77/79 (calcined) | 47.25 | 71.00 | 76.50 |
| 75/77 | 42.00 | 63.00 | 68.00 |
| 70/72 | 40.00 | 60.00 | 65.00 |
| Youssoufia: | | | |
| 70/72 | 37.50 | 56.26 | 60.75 |

Source: British Sulphur Corporation, Ltd. Phosphorus and Potassium. No. 75, January/February 1975, p. 6.

Interestingly, OCP established prices considerably higher than the price published by the Florida Phosphate Rock Export Association. For comparison purposes these prices in $US per metric ton f.o.b. Tampa or Jacksonville, follow:

| Grade percent BPL | January 1974 | July 1974 | October 1974 |
|---|---|---|---|
| 77/76 | 29.53 | 46.75 | 62.00 |
| 75/74 | 27.07 | 41.34 | 55.00 |
| 72/70 | 23.62 | 35.43 | 48.00 |
| 70/68 | 21.65 | 32.48 | 43.00 |
| 68/66 | 19.68 | 29.53 | 39.00 |
| 66/64 | 17.72 | 27.07 | 36.00 |

OCP planned to increase phosphate rock production for export markets and processing rock into fertilizers, which may be more profitable in the export market. Production of phosphoric acid and triple superphosphate started in 1965. Ammonium phosphate capability was added and a nitrogen, phosphorus, potash (NPK) plant was started in 1972. Maroc Chimie converted 600,000 tons of rock into fertilizer in 1973. Investment from 1973 onward will increase rock capacity and processed phosphate capacity, with the latter based on lower grade rock. The fraction of rock output absorbed for further processing will rise from 3.5% in 1973 to an estimated 33% in 1985, reflecting the new orientation in OCP policy.

At the Khouribga complex, two 160-ton-per-hour dryers were added in 1974 at Beni Idir, raising the total capacity to 8.75 million tons per year. Khouribga production totaled 14 million tons in 1974, and production is expected to increase to 17 million tons in 1975. A new drying plant located between Kerkour Rih and Oued Zem reportedly will be completed by 1977, with the installation of six 1-million-ton-per-year dryers similar to those at Beni Idir. Production reportedly will increase to 20 million tons per year or more in 1977.

The new calcination plant at Youssoufia was to be completed in 1975. Recette 7 is producing black phosphate rock from below the water table at the rate of 400,000 tons per year. Overall production at Youssoufia will be increased from both underground and surface mines. In 1977, 4.1 million tons from underground mines and 1.5 million tons from surface mines are scheduled. The black rock from Recette 7, and that planned from Recettes 8 and 9, will be calcined and consumed in Moroccan fertilizer plants.

Development work at the new mine at Ben Guerir was started in 1974. Ben Guerir 1 production is expected to grow to 2.65 million tons per year and be consumed by Maroc Phosphore 2, which will be located on the rail line connecting Youssoufia and Maroc Phosphore 1, south of Safi. Ben Guerir 2 will start producing in 1981, and is scheduled to increase production to 9.75 million tons per year by 1990. This production will probably supply the petrochemical and fertilizer complex planned at Jorf Lasfar.

The deposit at Sidi Hajjaj is also scheduled to start producing in 1981. It will eventually reach a production level of 10 million tons per year. It is considerably different from the ore at Ben Guerir, where only screening is required to upgrade the ore to an acceptable quality. At Sidi Hajjaj, the ore will be mined and shipped to a plant near the port of Jorf Lasfar and washed in sea water. Each ton of product analyzing 65% to 66% BPL from this ore will require disposal of more than a million tons (6 to 8 million cubic meters) of slimes. The final concentrate will be washed with fresh water.

Sampling the Meskala deposit to assess the reserve and product grade has not been completed. Preliminary results appear encouraging and intergovernmental discussions with the U.S.S.R. on mine development are continuing. With or without U.S.S.R. participation, OCP plans to start production in 1986 and attain a production of 23 million tons per year by the year 2000.

OCP plans to produce more than 30 million tons per year in 1980, over 40 million tons per year by 1985, and expects world demand to support a production level of 100 million tons by 2000.

## MINERAL FUELS

**Coal.**—Production from the Government-controlled mine at Jerada increased from 565,000 tons of anthracite coal in 1973 to 574,000 tons in 1974. Although the increase in production was small, the Government considers maintenance of this production level a major accomplishment because of the difficulties in mining this deposit. The modernization program at the mine will include a new gallery, a new crushing and screening station, and a new conveyor system, which will permit production to increase to 830,000 tons in 1977. This mine will continue to supply fuel to the onsite powerplant, sugar mills, and area homes. Jerada exported 34,000 tons to Western Europe and Romania.

**Natural Gas.**—Production declined from the Société Chérifienne des Pétroles (SCP-50% BRPM and 50% French ownership) Field near Essaouira and the Gharb Field. Production declined from 2,302 million cubic feet (65 million cubic meters) in 1973 to 2,081 million cubic feet (59 million cubic meters) in 1974. Although production was sufficient to furnish power for the phosphate mines at Youssoufia and the Sidi Kacem refinery, additional demand for industrial projects in eastern Morocco, particularly the steel mill to be constructed at Nador, may require a pipeline to supply gas from Algeria. After the pipeline to Kenitra is completed, new gasfields will be opened in the Gharb to tap an estimated 750-million-cubic-meter reserve. This will provide additional energy for future demands. Discussions were in progress to define the route of a proposed pipeline from Algeria that will cross Morocco and Spain, and terminate in France.

**Oil Shale.**—Deposits of oil shale at Timahdit are estimated to contain 10% oil in 5 billion to 7 billion tons of rock. Recently discovered deposits at Tarfaya were under study by BRPM. Because the oil shales are the only proven resource of petroleum in Morocco, and with increasing cost for imported oil, the deposits are being intensively studied. Since similar deposits exist in the United States and Brazil, the technology and cost of extraction in these countries are followed closely. A process has not been selected and the timetable to extract hydrocarbons from the oil shales has not been established.

**Petroleum.**—The level of onshore seismic exploration increased in 1974. Soundings by BRPM, in association with private companies, were concentrated in the basin of Essaouira, and Tarfaya, and in the pre-Riffian region between Sidi Kacem and Taza. These basic studies will continue until two-thirds of the country are geologically mapped in 1977. The Ministry of Mines, however, attaches more importance to offshore exploration and the potential of oil shales. Sun Oil Co. was granted offshore exploration rights in 1974 for the Atlantic area between Ifni and Agadir. Practically the entire Atlantic area is covered under exploration contracts. Burmah Oil Company Ltd. has the area between Tanger and Rabat, and Esso and Shell have areas between Agadir and Tarfaya.

An oil exploration concession was, for the first time, granted in the Mediterranean with Standard Oil Co. of California being the recipient. More exploration activity is expected in the Mediterranean in 1975, although problems will develop where the Spanish enclaves of Ceuta and Melilla cut across areas that probably will be sounded.

# The Mineral Industry of the Netherlands

By Norman A. Matthews [1]

The Netherlands economy during most of 1974 was one of the strongest in Europe, which was largely attributable to increasing availability and exports of natural gas. However, in November, the onset of strong recessionary trends became apparent. The Government applied strong measures to sustain the economy, including temporary reductions in taxes on individual income and social services, increases in investment deductions, and accelerated writeoff for buildings and equipment for small- and medium-size businesses.

Gross national product (GNP) increased 3.5% in real terms to $64 billion.[2] The increase was moderated by the after effects of the oil embargo and a substantial reduction in domestic processing of crude petroleum and consumption of petroleum products. In general, industry operated at near-capacity levels through October, but the Western European malaise developed suddenly thereafter and export demand declined rapidly. The construction industry remained the most sluggish of all major industry segments, and was influenced strongly by a 20% decline in housing starts compared with the already depressed level in 1973. The textile industry also operated at a lower rate than that of 1973.

Although inflation persisted at a rate of about 10% during the year, the Government budget for 1975 increased 20% compared with that of 1974. The expansionary budget was designed primarily to ameliorate unemployment, which reached 3.8% at yearend and was expected to increase to 4.2% in the early months of 1975.

The Government energy policy announced in September emphasized nuclear powerplants, energy conservation to slow annual consumption growth, to 4.5% by 1980 and 2.2% by 1985, restrictions on natural gas exports, and the establishment of a state agency (Dutch Energy Agency) to administer energy research and development.

Although the foreign trade balance deteriorated to a modest deficit in 1974, the balance of payments achieved a record surplus of $1.3 billion. Value of imports from the United States increased 37% to $2.9 billion in 1974 compared with that of 1973. The increase was principally due to higher prices of feed grains, coal, and high-technology goods.

For the first time, the Government introduced a budget specifying multiyear commitments, including an increase amounting to 1½% of the national income to be contributed to economically weak countries beginning in 1976, and provision for a national disablement insurance plan benefiting low-income groups. The total tax and social insurance burden in 1974 was 49.2% of the net national income and a small increase was projected for 1975.

The Netherlands continued to undertake projects to promote trade and increase land resources. The Port Authority of Rotterdam is planning to develop and install a new radar control system for all sea traffic throughout the greater Rotterdam port area within 10 years. Projected cost is $80

[1] Physical scientist, Division of Ferrous Metals.
[2] Where necessary, values have been converted from the Netherlands guilders (f.) to U.S. dollars at the rate of f.2.69=US$1.00, the floating average for the year.

million. The last stage of the battle to control the sea off South Holland is nearing completion with the closing of the 5-mile-wide Oosterschelde eastern estuary. The delta plan involves a complex of dams, locks, water barriers, and bridges that will render 440 miles of dikes obsolete and protect a 1,900-square-mile region. Technology is being developed for the more difficult tasks involved in closing the deeper channels. The project is expected to cost more than $1 billion and require at least an additional 5 years.

The Ministry of Transport, Water Control, and Public Works proposed a 250-acre artificial island 30 kilometers off the Hook of Holland to provide sites for nuclear powerstations, natural gas regasification facilities and a repair terminal for large tankers. The island will be made of material dredged from the oceanway, which is being deepened. The oceanway serves offshore unloading facilities for tankers too large to enter the inner harbor at Rotterdam. Cost was estimated at $75 million.

## PRODUCTION

Production of most mineral commodities was at record levels during the first 9 to 10 months of 1974. During the last quarter, however, sharp declines occurred in many segments of the manufacturing economy owing to the sudden decrease in export demand. Coal production declined to 758,000 tons or 44% of the tonnage produced in 1973 as the last state-owned coal mine was closed. Natural gas production was 83,725 million cubic meters, a 17% increase over that of 1973. More than 50% of the volume (43,600 million cubic meters) was exported; this represented a 33% increase in export volume compared with that of 1973. Exports were to West Germany, Belgium-Luxembourg, France, and Italy. The pipeline to Italy was inaugurated at midyear and a relatively small volume of natural gas was transmitted in 1974.

Considerably less crude petroleum was processed during the year, which resulted in production of 60.9 million tons of products. This was a decline of 12% compared with the tonnage of products produced in 1973. Domestic consumption of products approximated 21 million tons, a 16% decline compared with consumption in 1973. At yearend, most refineries were operating at 50% to 70% of capacity. There was also a substantial reduction in crude petroleum transshipped by pipeline to Belgium and West Germany through the Port of Rotterdam. On the other hand, the amount of container freight traffic through Amsterdam and Rotterdam increased 11% over the 1973 volume to 422,800 containers. Total electrical energy generated in 1974 approximated 55,459 gigawatt-hours, a 5% increase over that of 1973 whereas prior annual increases had exceeded 7%.

Steel, pig iron, and coke production increased modestly compared with production in 1973; facilities operated at near capacity through yearend. Although shipments declined during the last 8 to 10 weeks of the year, production was sustained to build inventories of slabs, blooms, hot-rolled coils, and other semifinished products. Raw steel production was 5.84 million tons and exceeded that in 1973 by 4%; 92% of the product was produced by the basic oxygen process, with most of the balance produced in electric arc furnaces. Scrap consumption totaled 1.93 million tons and constituted 24% of the charges of the basic oxygen furnaces. Product shipments declined slightly to 3.86 million tons, whereas semifinished products for inventory and sale totaled 1.22 million tons, an 8% increase over those of 1973. Shipments of iron castings (310,000 tons) increased 16% compared with 1973 shipments. However, the order backlog at yearend declined substantially, as was the case in the steel industry generally.

Nonferrous metals production generally increased in 1974 compared with that of 1973. Specific comparisons follow, with 1974 production figures related to those of 1973 by a percentage increase (+) or decrease (−) for the individual metals or alloys: Primary aluminum, 252,000 tons (+32%); aluminum rolled and extruded products, 99,658 tons (+4%); copper wrought products, 63,174 tons (+8%); lead and lead alloys, 26,410 tons (+5%); and wrought lead and alloys, 13,297 tons (−16%).

In the nonmetallic minerals and products sector, production generally equaled that of 1973; growth was impaired by the construction industry, which experienced the lowest operating rate of any major industrial segment. Housing starts and completions were lower than those of 1973 by 12% in value and 20% in number of units. Housing starts in 1974 totaled 111,960 units compared with 141,135 units in 1973, which was also a decrease from that of 1972. Only in the heavy industrial building sector, such as chemical plants and metal manufacturing and processing plants, was investment in new construction higher in 1974 than in 1973. Total investment in industrial manufacturing facilities approximated $472 million in 1974, a 5% decline compared with that of 1973. Production of brick, tile, cement (4,088,000 tons), and concrete were the same as those of 1973. Production of 1,520,000 tons of concrete ware was 8% less than the tonnage produced in 1973.

Growth continued in the chemicals and plastics area, but it did not equal the 15% to 20% annual growth rate of recent years. Consumption of materials in manufacturing plastics increased 6% to 1.68 million tons. However, some of the raw materials consumed resulted in an increase in plastic inventories. Production of fertilizer intermediate materials, such as nitrogen, ammonia, sulfuric acid, ammonium sulfate, and phosphate, increased modestly in 1974. Total production of fertilizer intermediates was 1,937,000 tons, a 5% increase over that of 1973. However, a significant decrease in the production rate occurred for most chemical and fertilizer commodities in the last 2 months of the year because markets throughout Western Europe became saturated.

The rapid decline in industrial activity that developed late in 1974 can be shown most clearly by the following indices:

| Industry | Industry production indices in 1974 by quarters | | | |
|---|---|---|---|---|
| | 1st | 2d | 3d | 4th |
| Minerals extraction | 143 | 124 | 117 | 111 |
| Chemicals | 147 | 168 | 163 | 140 |
| Chemical exports | 155 | 179 | 174 | 150 |
| Rubber | 125 | 130 | 115 | 105 |
| Metals | 118 | 141 | 135 | 110 |
| Metal exports | 117 | 146 | 142 | 115 |
| Textile | 116 | 111 | 95 | 91 |
| Fabricated metals | 108 | 122 | 115 | 107 |
| Fabricated metal exports | 113 | 134 | 124 | 120 |
| Machinery | 110 | 121 | 123 | 118 |
| Machinery exports | 114 | 126 | 127 | 121 |
| Overall industry | 117 | 127 | 124 | 120 |

Changes in price for several industrial commodities compared with 1973 prices were as follows: Coal, +27%; domestic crude petroleum, +4%; domestic natural gas, +4%; textiles, +8%; chemical products, +16%; petroleum products, +27%; and primary metals and products, +9%. Overall, the price for industrial products increased about 13% during 1974. The overall productivity increase for industry during the year was estimated as 7%.

Table 1.—Netherlands: Production of mineral commodities
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| METALS | | | | |
| Aluminum metal, primary | | 166,353 | 190,018 | 251,711 |
| Cadmium metal [e] | | [r] 122 | [r] 31 | 120 |
| Iron and steel: | | | | |
| Sintered ore (from imported ore) | thousand tons | 3,642 | 3,426 | 3,280 |
| Pig iron including blast furnace ferroalloys | do | 4,289 | 4,707 | 4,804 |
| Crude steel | do | 5,585 | 5,624 | 5,840 |
| Semimanufactures | do | 5,077 | 5,103 | 5,122 |
| Lead metal, primary | | 21,981 | 25,256 | 26,410 |
| Zinc metal, primary | | 50,300 | 30,500 | 78,200 |
| NONMETALS | | | | |
| Cement | thousand tons | 4,023 | 4,077 | 4,088 |
| Fertilizer materials, manufactured: | | | | |
| Nitrogenous, nitrogen content | do | 1,119 | 1,112 | 1,170 |
| Phosphatic, phosphorous pentoxide content | do | 304 | 302 | 378 |
| Salt, all types | do | 2,803 | 3,044 | 3,387 |
| Sand, industrial | do | 23,500 | 24,600 | 23,514 |
| Sulfur: | | | | |
| Elemental, byproduct | | 45,300 | [e] 42,000 | [e] 46,000 |
| Sulfuric acid (100% $H_2SO_4$) | thousand tons | [r] 558 | 531 | 657 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Carbon black | | 93,400 | 99,400 | 101,000 |
| Coal, anthracite and bituminous | thousand tons | 2,811 | 1,722 | 758 |
| Coke, oven | do | 1,994 | 2,655 | 2,684 |
| Fuel briquets, all grades | do | 465 | 250 | --- |
| Gas: | | | | |
| Manufactured, all types [2] | million cubic feet | 82,426 | 101,441 | 104,890 |
| Natural: | | | | |
| Gross production | do | 2,063,073 | 2,501,467 | 2,956,707 |
| Marketable | do | 2,052,443 | 2,494,687 | [e] 2,817,960 |
| Petroleum: | | | | |
| Crude oil | thousand 42-gallon barrels | 10,885 | 10,169 | 10,227 |
| Refinery products: | | | | |
| Gasoline: | | | | |
| Aviation | do | 1,958 | 1,558 | 1,593 |
| Motor | do | 44,965 | 48,918 | 48,416 |
| Jet fuel | do | 24,896 | 27,912 | 23,264 |
| Kerosine | do | 9,757 | 9,447 | 5,929 |
| Distillate fuel oil | do | 145,664 | 153,370 | 129,595 |
| Residual fuel oil | do | 177,163 | 180,886 | 154,319 |
| Lubricants | do | 3,346 | 3,290 | 4,032 |
| Bitumen | do | 5,909 | 5,490 | 6,078 |
| Liquefied petroleum gas | do | 9,953 | 11,206 | 9,582 |
| Other | do | 61,158 | 68,096 | 65,927 |
| Refinery fuel and losses | do | 34,129 | 34,274 | 30,176 |
| Total | do | 518,898 | 544,447 | 478,911 |

[e] Estimate. [p] Preliminary. [r] Revised.
[1] In addition to the commodities listed, the Netherlands presumably produces a variety of crude construction materials (clays, sands, stone and gravel) but production is not reported and available information is inadequate to make reliable estimates of output levels.
[2] Coke oven and blast furnace gas only.

## TRADE

The foreign trade of the Netherlands increased substantially in value in 1974 because of generally higher prices. Export and import values increased 24% and 25%, respectively, compared with those of 1973. The balance of trade showed a modest deficit of $1.17 billion in 1974, whereas export and import values were essentially in balance in 1973. The dominating factor in 1974 was the great increase in cost of crude petroleum imports, although higher prices also applied to many other raw material imports such as feed grains, coal, and iron ore. Export and import trade values in 1974 were $32.9 billion and $34.1 billion, respectively.

Among the broad categories of industrial products, the Netherlands maintained trade surpluses in 1974 in mineral products (including metals and fuels), $0.02 billion, and chemical products, $1.56 billion. Deficits persisted in machinery (electrical and mechanical), $0.47 billion; fabricated products, $1.67 billion (of which textiles accounted for $0.52 billion and metal products accounted for $0.48 billion); and transportation equipment (aircraft, boats, automobiles, etc.), $0.74 billion.

The European Economic Community (EEC) accounted for approximately 65% of total exports. The principal trading partners were West Germany, Belgium-Luxembourg, France, the United Kingdom, and the United States. The United States ranked third in exports to the Netherlands with a total value of approximately $2.9 billion, principally in animal feed grains and supplements, coal, and high-technology material.

Foreign trade showed a modest surplus through the second quarter of 1974, but a deficit developed unexpectedly in the third quarter, which prompted the Government to reassess projections for 1975 and formulate policy accordingly. The importance of exports to the Netherlands economy is shown in the following tabulation, which compares the value of domestic sales and exports for major segments of the manufacturing industry in the third quarter of 1974, in million dollars:

| Industry [1] | Domestic sales | Exports | Total |
|---|---|---|---|
| Mining | 237 | 212 | 449 |
| Food products | 2,409 | 935 | 3,344 |
| Textiles and products | 216 | 172 | 388 |
| Paper and paper products | 254 | 148 | 402 |
| Petroleum products | 630 | 776 | 1,406 |
| Chemical products | 627 | 1,357 | 1,984 |
| Building materials | 262 | 72 | 334 |
| Metals | 215 | 407 | 622 |
| Metal fabrications | 524 | 141 | 665 |
| Machinery | 363 | 353 | 716 |
| Overall industry total (except utilities) | 7,512 | 5,858 | 13,370 |

[1] Not all industry segments listed individually.
Source: Maandstatistiek van de Industrie, March 1975.

Crude mineral imports constituted one of the most significant deficit groups in the Netherlands foreign trade balance. Higher prices, rather than volume increases, influenced the overall trade deficit in 1974. Quantities and values of the most significant items imported through September 1974 were as follows: Crude petroleum, 49.8 million tons ($3.89 billion); coking coal, 3.2 million tons ($110 million); iron ore, 5.6 million tons ($80 million); zinc concentrates, 151,000 tons ($29 million); and molybdenum ore and concentrates, 220,000 tons ($76 million). In contrast, the value of the principal natural resource exported during the same period was $595 million for 33,760 million cubic meters of natural gas.

Overall export categories were as follows, in order of value: (1) petroleum products, (2) chemicals, (3) electrical machinery, (4) mechanical machinery, (5) iron and steel products, and (6) plastic products. Import categories were as follows, in order of value: (1) crude petroleum, (2) mechanical machinery, (3) electrical machinery, (4) transportation equipment, (5) grains and supplements, (6) iron and steel products, (7) chemicals, and (8) nonferrous metals.

**Table 2.—Netherlands: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite | 7,906 | 4,610 | West Germany 4,169. |
| Oxide and hydroxide | 15,113 | 22,465 | Japan 5,586; West Germany 4,465; Italy 3,388. |
| Metal including alloys: | | | |
| Scrap | 32,218 | 30,664 | West Germany 14,878; Belgium-Luxembourg 9,667; France 3,504. |
| Unwrought | 154,767 | 193,664 | Belgium-Luxembourg 77,341; West Germany 54,634; France 48,272. |
| Semimanufactures | 64,049 | 74,142 | West Germany 29,908; Belgium-Luxembourg 17,019; France 8,266. |
| Antimony metal including alloys, all forms | 13 | 61 | West Germany 19; Italy 10; Republic of Korea 10. |
| Bismuth including alloys, all forms | 50 | 30 | France 10; West Germany 8; Belgium-Luxembourg 6. |
| Cadmium including alloys, all forms | 158 | 74 | Belgium-Luxembourg 37; West Germany 13; France 12. |

## Table 2.—Netherlands: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Chromium: | | | |
| Chromite | 6,715 | 7,617 | Italy 2,556; France 1,753. |
| Oxide and hydroxide | 434 | 573 | West Germany 444; France 78. |
| Cobalt: | | | |
| Oxide and hydroxide | r 49 | 23 | West Germany 13; United Kingdom 10. |
| Metal including alloys, all forms | 97 | 155 | West Germany 51; United Kingdom 34; Sweden 29. |
| Columbium and tantalum: Tantalum, including alloys, all forms | 9 | 10 | United Kingdom 8. |
| Copper metal including alloys: | | | |
| Scrap | 30,749 | 42,109 | West Germany 23,016; Belgium-Luxembourg 14,418. |
| Unwrought | 8,608 | 12,551 | France 3,858; West Germany 2,712; Belgium-Luxembourg 2,554. |
| Semimanufactures | 28,541 | 33,132 | West Germany 11,680; United States 5,600; Belgium-Luxembourg 4,041. |
| Germanium metal, including alloys, all forms | 4 | 7 | All to Belgium-Luxembourg. |
| Gold [1] thousand troy ounces | r 171 | 332 | France 52; Hong Kong 34. |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite thousand tons | 77 | 497 | West Germany 493. |
| Roasted pyrite do | 13 | -- | |
| Metal: | | | |
| Scrap do | 836 | 1,122 | West Germany 844; Belgium-Luxembourg 158; Spain 70. |
| Pig iron and ferroalloys [2] do | 10 | 171 | People's Republic of China 122; West Germany 38. |
| Steel, primary forms do | 1,731 | 1,765 | West Germany 409; Belgium-Luxembourg 395; Spain 204. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections do | 557 | 609 | West Germany 150; Belgium-Luxembourg 123; United Kingdom 99. |
| Universals, plates, sheets do | 1,767 | 1,781 | United States 357; West Germany 283; United Kingdom 233. |
| Hoop and strip do | 169 | 186 | West Germany 127; Belgium-Luxembourg 14. |
| Rails and accessories do | 21 | 45 | Italy 19; West Germany 12; Singapore 5. |
| Wire do | 35 | 42 | West Germany 14; France 13. |
| Tubes, pipes, fittings do | 383 | 395 | West Germany 154; Nigeria 53; France 47. |
| Castings and forgings do | 9 | 8 | West Germany 4; Belgium-Luxembourg 3. |
| Lead: | | | |
| Oxides | r 845 | 673 | Belgium-Luxembourg 403. |
| Metal: | | | |
| Scrap | 17,281 | 19,565 | West Germany 9,414; Belgium-Luxembourg 4,944; France 4,401. |
| Unwrought | 22,857 | 25,272 | West Germany 12,239; Poland 7,255; France 2,262. |
| Semimanufactures | 2,836 | 2,611 | Belgium-Luxembourg 569; United Kingdom 434; Norway 411. |
| Magnesium metal, including alloys: | | | |
| Scrap | 1,088 | 1,183 | United States 481; Italy 251; Belgium-Luxembourg 187. |
| Unwrought and semimanufactures | [3] 1,032 | 1,526 | West Germany 1,390. |
| Manganese: | | | |
| Ore and concentrate | 46,159 | 35,247 | West Germany 18,213; United Kingdom 3,004; Norway 2,305. |
| Oxide | 237 | 141 | Yugoslavia 46; Belgium-Luxembourg 29; France 21. |
| Mercury 76-pound flasks | 1,131 | 493 | West Germany 232; France 116. |
| Molybdenum, including alloys, all forms | 117 | 119 | United States 28; West Germany 21; Belgium-Luxembourg 11. |
| Nickel: | | | |
| Matte, speiss, and similar materials | 22 | 458 | Romania 328; West Germany 72. |
| Oxide and hydroxide | 729 | 601 | Belgium-Luxembourg 260; Romania 237; Sweden 51. |

See footnotes at end of table.

## Table 2.—Netherlands: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Nickel—Continued | | | |
| Metal including alloys: | | | |
| Scrap | 3,199 | 1,667 | West Germany 721; Austria 231; Sweden 201. |
| Unwrought and semimanufactures | 9,696 | 12,089 | Sweden 5,316; United Kingdom 2,117; Italy 1,124. |
| Platinum-group metals, all forms troy ounces | 38,131 | 26,814 | Hong Kong 16,815; Belgium-Luxembourg 7,363. |
| Silver metal including alloys, all forms thousand troy ounces | 4,324 | 4,513 | Belgium-Luxembourg 1,706; West Germany 712; Czechoslovakia 616. |
| Tellurium, elemental and arsenic | 5 | 16 | France 10; Brazil 5. |
| Tin metal, including alloys: | | | |
| Scrap long tons | 1,017 | 542 | West Germany 188; United Kingdom 168; Denmark 53. |
| Unwrought do | 1,228 | 1,567 | West Germany 1,052; Belgium-Luxembourg 202; France 135. |
| Semimanufactures do | 471 | 516 | West Germany 180; Belgium-Luxembourg 123; Italy 60. |
| Titanium dioxide | 25,526 | 26,323 | West Germany 8,335; France 4,810; Italy 4,360. |
| Tungsten: | | | |
| Ore and concentrate | 374 | 560 | France 161; United Kingdom 132; United States 108. |
| Metal including alloys, all forms | 125 | 168 | Belgium-Luxembourg 52; West Germany 42; France 19. |
| Zinc: | | | |
| Ore and concentrate | 13,069 | 23,747 | West Germany 18,213; United Kingdom 3,004; Norway 2,305. |
| Oxide | 13,240 | 15,103 | Belgium-Luxembourg 2,452; Germany 2,200; Italy 1,060. |
| Metal including alloys: | | | |
| Scrap | 7,348 | 11,238 | France 8,642; West Germany 1,728; Belgium-Luxembourg 750. |
| Dust (blue powder) | 542 | 1,073 | NA. |
| Unwrought | 49,179 | 39,663 | West Germany 15,060; France 7,081; Denmark 2,472. |
| Semimanufactures | 1,034 | 1,618 | West Germany 906; Belgium-Luxembourg 379. |
| Other: | | | |
| Ore and concentrate | 16,482 | 25,953 | West Germany 5,798; Austria 4,448; Italy 4,015. |
| Base metals, including alloys, all forms, n.e.s | 188 | 228 | United Kingdom 96; West Germany 33; Switzerland 26. |
| Ash and residue containing nonferrous metals: | | | |
| Aluminum [4] | 5,598 | 7,092 | West Germany 5,522; France 1,570. |
| Lead | 7,933 | 4,335 | West Germany 1,979; Belgium-Luxembourg 1,668. |
| Zinc | 7,633 | 7,980 | West Germany 4,028; Belgium-Luxembourg 1,846; France 1,120. |
| Other [4] | 5,091 | 4,457 | West Germany 2,406; Spain 2,296; United Kingdom 766. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum | 5,107 | 8,237 | West Germany 2,246; France 718. |
| Dust and powder of precious and semiprecious stones, including diamond thousand carats | 1,929 | 1,949 | Italy 366; United Kingdom 218; France 205. |
| Grinding and polishing stones | 1,676 | 1,990 | West Germany 658; United Kingdom 367; France 227. |
| Asbestos | 248 | 220 | Belgium-Luxembourg 124; France 71; West Germany 23. |
| Barite and witherite | 2,638 | 41,295 | United Kingdom 16,290; Norway 11,115; Belgium-Luxembourg 7,256. |
| Borates, crude natural | 353,273 | 420,680 | West Germany 83,574; United Kingdom 72,149; France 699. |
| Cement | r 127,490 | 145,580 | West Germany 93,468; Belgium-Luxembourg 29,577; Israel 9,063. |
| Chalk | 24,886 | 37,491 | Belgium-Luxembourg 36,776. |

See footnotes at end of table.

## Table 2.—Netherlands: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Clays and clay products: | | | |
| Crude clays: | | | |
| Kaolin | 50,274 | 53,905 | Belgium-Luxembourg 52,793. |
| Refractory | 10,928 | 3,056 | United Kingdom 1,256; Norway 1,056. |
| Other, including bentonite | 128,006 | 143,547 | West Germany 90,425; Belgium-Luxembourg 38,335; France 8,873. |
| Clay products: | | | |
| Refractory, including nonclay brick | 19,007 | 13,273 | West Germany 6,141; Belgium-Luxembourg 1,665; France 1,129. |
| Nonrefractory - thousand tons | 742 | 732 | West Germany 575; Belgium-Luxembourg 114. |
| Diamond, not set or strung, except dust and powder ---- thousand carats | [5] 1,591 | 2,520 | Israel 1,024; United States 344; Belgium-Luxembourg 326. |
| Diatomite and other infusorial earth | 144 | 231 | Belgium-Luxembourg 121; United Kingdom 44; West Germany 36. |
| Feldspar, fluorspar, leucite | 169 | 1,009 | West Germany 554; France 293; Belgium-Luxembourg 135. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous (nitrogen content) | 358 | 439 | United States 133; India 40; Pakistan 32. |
| Phosphatic | 6,258 | 39,681 | West Germany 25,460; France 9,025; Belgium-Luxembourg 5,189. |
| Other | 32,691 | 28,708 | Belgium-Luxembourg 17,030; France 6,130; West Germany 4,868. |
| Manufactured: | | | |
| Nitrogenous - thousand tons | 2,203 | 2,564 | United States 455; Brazil 277; Turkey 245. |
| Phosphatic, including Thomas slag ---- do | 388 | 348 | France 138; West Germany 33. |
| Potassic ($K_2O$ content) | 135 | 287 | United Kingdom 111; Belgium-Luxembourg 93. |
| Other, including mixed thousand tons | 817 | 979 | France 378; 592 unreported. |
| Ammonia, anhydrous | 556,582 | 563,608 | Belgium-Luxembourg 294,421; West Germany 105,358; France 45,170. |
| Graphite, natural | 134 | 324 | West Germany 226; Yugoslavia 36. |
| Gypsum and plasters | 3,691 | 1,089 | Belgium-Luxembourg 583; United Kingdom 208; France 138. |
| Lime | 1,199 | 1,894 | France 644; Belgium-Luxembourg 481; West Germany 427. |
| Magnesite | 20,764 | 32,995 | West Germany 13,744; United Kingdom 4,115; France 3,555; Belgium-Luxembourg 3,387. |
| Mica | 208 | 540 | Oman 150; West Germany 113; Brunei 56. |
| Pigments, mineral, including processed iron oxides | 1,117 | 1,427 | Belgium-Luxembourg 416; West Germany 246; Indonesia 165. |
| Precious and semiprecious stones except diamond ---- kilograms | 7,169 | 8,421 | West Germany 4,686; United States 2,718. |
| Salt ---- thousand tons | 1,824 | 2,077 | West Germany 543; Sweden 454; Finland 252. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Unworked and partly worked | 4,486 | 6,797 | West Germany 4,523; Belgium-Luxembourg 1,714. |
| Worked | 4,179 | 4,318 | West Germany 2,048; Belgium-Luxembourg 1,499. |
| Dolomite | 4,523 | 4,383 | West Germany 4,136. |
| Gravel and crushed stone thousand tons | 4,895 | 3,831 | Belgium-Luxembourg 3,544; West Germany 285. |
| Limestone | 4,029 | 1,188 | Belgium-Luxembourg 1,185. |
| Quartz and quartzite | 9,509 | 10,435 | West Germany 7,090; Belgium-Luxembourg 2,446. |
| Sand, excluding metal-bearing thousand tons | 9,886 | 8,964 | Belgium-Luxembourg 8,281. |
| Sulfur: | | | |
| Elemental | 16 | 832 | West Germany 754. |
| Sulfur dioxide | 1,228 | 1,327 | West Germany 137; Belgium-Luxembourg 105; 1,085 unreported. |
| Sulfuric acid, oleum | 45,891 | 60,158 | Belgium-Luxembourg 31,158; West Germany 9,707. |
| Talc and steatite | 508 | 665 | West Germany 252; Belgium-Luxembourg 236; Curaçao 71. |

See footnotes at end of table.

## Table 2.—Netherlands: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Other nonmetals, n.e.s.: | | | |
| Slag, dross and similar waste, not metal-bearing: | | | |
| From iron and steel manufacture ____ thousand tons | 160 | 71 | West Germany 51; Belgium-Luxembourg 20. |
| Other ____ do ____ | 45 | 52 | Belgium-Luxembourg 30; France 10; West Germany 7. |
| Other, n.e.s ____ do ____ | 186 | 218 | West Germany 94; France 54; Belgium-Luxembourg 45. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 108 | 116 | West Germany 105. |
| Carbon black | 77,875 | 87,282 | France 37,753; West Germany 20,578; Belgium-Luxembourg 11,600. |
| Coal and briquets: | | | |
| Anthracite and bituminous coal thousand tons | 1,701 | 1,513 | West Germany 576; Belgium-Luxembourg 512; France 363. |
| Briquets of anthracite and bituminous coal ____ do ____ | 376 | 259 | Belgium-Luxembourg 122; West Germany 72; France 54. |
| Coke and semicoke ____ do ____ | 760 | 680 | France 299; Belgium-Luxembourg 244; West Germany 116. |
| Gas, manufactured ____ do ____ | 107 | 110 | Belgium-Luxembourg 95. |
| Gas, natural ____ billion cubic feet | 1,104 | 1,294 | West Germany 659; Belgium-Luxembourg 343; France 292. |
| Hydrogen, helium, rare gases | 4,800 | 9,662 | Belgium-Luxembourg 4,490; West Germany 3,376; France 1,113. |
| Peat, including peat briquets and litter | 60 | 69 | Belgium-Luxembourg 53; France 13. |
| Petroleum:[6] | | | |
| Crude thousand 42-gallon barrels | 134,418 | 157,067 | Belgium-Luxembourg 54,698; West Germany 42,416; United Kingdom 21,934. |
| Refinery products: | | | |
| Gasoline ____ do ____ | 60,444 | 66,640 | West Germany 42,415; United Kingdom 12,733; Belgium-Luxembourg 5,440. |
| Kerosine and jet fuel ____ do ____ | 23,134 | 26,334 | West Germany 8,688; United Kingdom 7,069; Denmark 2,645. |
| Distillate fuel oil ____ do ____ | r 107,272 | 123,411 | West Germany 84,731; ship stores 9,874; Belgium-Luxembourg 7,866. |
| Residual fuel oil ____ do ____ | 167,206 | 163,590 | Ship stores 64,209; United Kingdom 30,822; West Germany 16,530. |
| Liquefied petroleum gas ____ do ____ | 5,391 | 6,780 | Belgium-Luxembourg 2,823. |
| Lubricants ____ do ____ | 3,857 | 3,302 | Belgium-Luxembourg 551. |
| Mineral jelly and wax ____ do ____ | 489 | 697 | West Germany 291; Morocco 164. |
| Bituminous mixtures ____ do ____ | 231 | 340 | West Germany 111; Sweden 70; Norway 66. |
| Other ____ do ____ | 2,893 | 2,410 | United Kingdom 721; West Germany 586; Belgium-Luxembourg 309. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ____ thousand tons | 316 | 427 | West Germany 165; United Kingdom 77; Belgium-Luxembourg 47. |

r Revised. NA Not available.

[1] Excludes monetary gold.

[2] Includes sponge iron, shot, grit, pellets, powder, spiegeleisen, and ferromanganese.

[3] Includes some scrap.

[4] Exports of ash and residue containing aluminum to Belgium-Luxembourg are included with other ash and residue.

[5] Excludes exports to Belgium-Luxembourg not reported in source publication.

[6] Includes bunkers.

## Table 3.—Netherlands: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite | 145,873 | 128,451 | Greece 124,854. |
| Alumina | r 342,754 | 431,899 | Surinam 207,497. |
| Metal including alloys: | | | |
| Scrap | 19,150 | 20,856 | West Germany 11,245; East Germany 5,121. |
| Unwrought | 65,249 | 96,831 | Norway 50,591; West Germany 11,804; Canada 10,746. |
| Semimanufactures | 61,371 | 74,071 | West Germany 34,201; Belgium-Luxembourg 20,945; France 7,360. |
| Antimony metal including alloys, all forms | 99 | 110 | People's Republic of China 49; Italy 21; U.S.S.R. 12; Japan 12. |
| Arsenic, oxides and acids | 756 | 830 | France 368; Belgium-Luxembourg 364. |
| Beryllium metal including alloys, all forms | 5 | 2 | West Germany 1; United States 1. |
| Bismuth metal including alloys, all forms | 111 | 150 | Mexico 51; Belgium-Luxembourg 30; United Kingdom 21. |
| Cadmium metal including alloys, all forms | 130 | 159 | Japan 57; Belgium-Luxembourg 35. |
| Chromium: | | | |
| Chromite | r 10,660 | 5,588 | Finland 5,198. |
| Oxides and hydroxides | 1,203 | 1,655 | West Germany 641; France 495; U.S.S.R. 379. |
| Metal including alloys, all forms | 43 | 55 | Japan 25; France 21. |
| Cobalt: | | | |
| Oxides and hydroxides | 251 | 328 | Belgium-Luxembourg 282. |
| Metal including alloys, all forms | 156 | 126 | West Germany 42; Belgium-Luxembourg 40; United Kingdom 20. |
| Columbium and tantalum: Tantalum | 2 | 4 | United States 3. |
| Copper: | | | |
| Copper sulfate | 2,988 | 3,213 | France 1,854; Belgium-Luxembourg 1,108. |
| Metal including alloys: | | | |
| Scrap | 6,936 | 8,719 | West Germany 3,813; United Kingdom 1,294; Belgium-Luxembourg 719. |
| Unwrought | 45,165 | 49,863 | Belgium-Luxembourg 16,220; U.S.S.R. 11,434; Zaire 8,128. |
| Semimanufactures | 69,748 | 79,622 | Belgium-Luxembourg 40,282; West Germany 23,406; France 11,752. |
| Germanium metal including alloys, all forms | 1 | 5 | All from Belgium-Luxembourg. |
| Gold [1] thousand troy ounces | 512 | 949 | West Germany 792. |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite thousand tons | 5,666 | 6,973 | Liberia 2,465; Sweden 1,571; Brazil 1,219. |
| Metal: | | | |
| Scrap do | 173 | 182 | West Germany 90; Belgium-Luxembourg 71. |
| Pig iron [2] do | 67 | 67 | West Germany 28; Norway 7; Canada 6. |
| Ferroalloys do | 41 | 49 | Norway 23; West Germany 9; France 8. |
| Steel primary forms do | 720 | 682 | Belgium-Luxembourg 307; West Germany 183; Norway 118. |
| Semimanufactures: | | | |
| Bars, rods, sections do | 1,331 | 1,475 | Belgium-Luxembourg 812; West Germany 453; France 130. |
| Universals, plates, sheets do | 969 | 1,196 | Belgium-Luxembourg 545; West Germany 460. |
| Hoop and strip do | 217 | 233 | West Germany 142; Belgium-Luxembourg 41; France 38. |
| Rails and accessories do | 45 | 43 | West Germany 26; France 13. |
| Wire do | 98 | 98 | Belgium-Luxembourg 51; West Germany 41. |
| Tubes, pipes, fittings do | 714 | 763 | West Germany 492; France 139; Belgium-Luxembourg 57. |
| Castings and forgings do | 11 | 13 | West Germany 6; Belgium-Luxembourg 5. |

See footnotes at end of table.

## Table 3.—Netherlands: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Lead: | | | |
| Oxides | 10,318 | 13,559 | West Germany 3,794; Mexico 3,495; France 3,404. |
| Metals including alloys: | | | |
| Scrap | 12,911 | 35,122 | Canada 10,936; West Germany 6,146; Sweden 3,893; Poland 3,859. |
| Unwrought | 50,761 | 51,596 | United Kingdom 12,803; Belgium-Luxembourg 12,389; Australia 11,341. |
| Semimanufactures | 2,749 | 2,983 | Belgium-Luxembourg 1,907; West Germany 631. |
| Magnesium metal including alloys: | | | |
| Scrap | 612 | 683 | Norway 169. |
| Unwrought | r 707 | 2,844 | United States 1,644; U.S.S.R. 531; Norway 379. |
| Semimanufactures | r 124 | 126 | West Germany 100; United States 14. |
| Manganese: | | | |
| Ore and concentrate | 74,778 | 79,379 | NA. |
| Oxide | 839 | 1,174 | Belgium-Luxembourg 1,140. |
| Mercury 76-pound flasks | 1,740 | 1,189 | Spain 377; U.S.S.R. 290; United Kingdom 174. |
| Molybdenum metal including alloys, all forms | 128 | 158 | France 62; United States 32; West Germany 22; United Kingdom 21. |
| Nickel: | | | |
| Matte, speiss, similar materials | 333 | 2,757 | Cuba 2,755. |
| Metal, including alloys: | | | |
| Scrap | 3,835 | 2,847 | West Germany 998; United Kingdom 662; France 410. |
| Unwrought | 4,222 | 4,564 | United Kingdom 1,407; Mozambique 1,245; Norway 723. |
| Semimanufactures | 3,759 | 3,926 | Sweden 2,077; West Germany 898. |
| Platinum-group metals, all forms thousand troy ounces | 95 | 79 | West Germany 19; France 18; U.S.S.R. 15. |
| Silver metal including alloys, all forms do | 6,520 | 6,388 | West Germany 2,242; France 1,513; United States 775. |
| Tellurium, elemental and arsenic | 8 | 16 | Sweden 7; U.S.S.R. 4; United States 4. |
| Tin: | | | |
| Ore and concentrate long tons | 611 | 476 | Peru 225; Republic of South Africa 125; Burma 122. |
| Oxide do | 71 | 154 | Japan 72; United Kingdom 42; West Germany 35. |
| Metal including alloys: | | | |
| Scrap do | r 93 | 342 | West Germany 180; Belgium-Luxembourg 75. |
| Unwrought do | r 5,596 | 6,527 | United Kingdom 2,005; Thailand 1,524; People's Republic of China 905. |
| Semimanufactures do | r 168 | 105 | West Germany 90. |
| Titanium: | | | |
| Ore and concentrate (ilmenite) | 8,363 | 63,185 | Canada 60,249. |
| Oxide | 5,816 | 7,876 | West Germany 4,971; Spain 910; Italy 589. |
| Metal including alloys, all forms | 158 | 182 | West Germany 47; United States 46; United Kingdom 31. |
| Tungsten: | | | |
| Ore and concentrate | r 1,263 | 1,501 | People's Republic of China 516; Portugal 269; Peru 149. |
| Metal including alloys, all forms | r 255 | 184 | West Germany 96; United Kingdom 35; Belgium-Luxembourg 27. |
| Zinc: | | | |
| Ore and concentrate | 78,924 | 98,471 | Canada 30,494; West Germany 25,269; Mexico 16,557. |
| Oxides | 4,965 | 15,103 | Belgium-Luxembourg 2,452; West Germany 2,200; Italy 1,060. |
| Metal including alloys: | | | |
| Scrap | 3,688 | 6,947 | West Germany 5,059; North Korea 824; United Kingdom 782. |
| Dust (blue powder) | 2,486 | 3,311 | West Germany 1,666; Belgium-Luxembourg 1,280. |
| Unwrought | 21,355 | 32,097 | West Germany 16,596; North Korea 6,510; France 3,994. |
| Semimanufactures | 4,991 | 5,579 | West Germany 3,088; Belgium-Luxembourg 2,377. |

See footnotes at end of table.

## Table 3.—Netherlands: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Other: | | | |
| Ores and concentrates of nonferrous metals, n.e.s | 19,749 | 30,138 | United States 27,284. |
| Ash and residues containing nonferrous metals: | | | |
| Lead | 6,513 | 5,642 | Sweden 2,507; West Germany 1,301; United States 911. |
| Zinc | 40,744 | 34,730 | West Germany 21,120; United Kingdom 3,100. |
| Other | r 68,528 | 64,685 | Canada 40,292; U.S.S.R. 14,689. |
| Metals including alloys, all forms: | | | |
| Metalloids: | | | |
| Phosphorous | 72 | 138 | West Germany 100; Austria 28. |
| Selenium | 12 | 13 | West Germany 4; Japan 4. |
| Silicon | 856 | 955 | France 509; West Germany 373. |
| Alkali, alkaline earth and rare-earth metals | 182 | 200 | West Germany 195. |
| Base metals, including alloys, all forms, n.e.s | 468 | 623 | Japan 321; France 98; United States 86; Belgium-Luxembourg 93. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc thousand tons | 842 | 268 | West Germany 225; Greece 33. |
| Dust and powder of precious and semiprecious stones thousand carats | 5,325 | 249 | Ireland 141; United Kingdom 95. |
| Grinding and polishing stones | 1,888 | 2,075 | West Germany 1,146; Austria 260. |
| Asbestos | 26,522 | 37,718 | Canada 28,995. |
| Barite and witherite | 65,437 | 101,296 | Peru 60,333; West Germany 19,020; Belgium-Luxembourg 8,186. |
| Boron materials: | | | |
| Crude natural borates | 370,839 | 380,822 | United States 375,342. |
| Oxide and acid | 2,089 | 2,324 | United States 887; Turkey 880; France 291; Belgium-Luxembourg 217. |
| Cement thousand tons | 2,333 | 2,464 | West Germany 1,244; Belgium-Luxembourg 1,160. |
| Chalk | 151,610 | 137,162 | Belgium-Luxembourg 64,826; France 47,885; United Kingdom 12,730. |
| Clays and clay products: | | | |
| Crude clays: | | | |
| Bentonite[3] thousand tons | 23 | 37 | West Germany 9. |
| Kaolin do | 230 | 324 | United Kingdom 185; West Germany 84; United States 26. |
| Refractory do | r 204 | 23 | West Germany 11; Belgium-Luxembourg 4; France 3. |
| Other[3] do | 421 | 514 | West Germany 483. |
| Products: | | | |
| Refractory, including nonclay brick do | 74 | 60 | West Germany 32; United Kingdom 14. |
| Nonrefractory do | 211 | 223 | West Germany 102; Belgium-Luxembourg 71; Italy 23. |
| Cryolite and chiolite | 948 | 268 | Denmark 243. |
| Diamond, all types thousand carats | [4] 1,276 | 2,418 | United Kingdom 876; Belgium-Luxembourg 665; United States 293. |
| Diatomite and other infusorial earth | 8,948 | 9,318 | France 3,864; Spain 1,559; Denmark 1,280; West Germany 1,160. |
| Feldspar, fluorspar, leucite | r 66,810 | 56,780 | Norway 22,404; Belgium-Luxembourg 6,859. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 22,950 | 26,138 | All from Chile. |
| Phosphatic thousand tons | 2,046 | 2,093 | United States 671; Togo 584; Morocco 502. |
| Potassic salts do | 21 | 10 | West Germany 9. |
| Other do | 47 | 52 | West Germany 44; Belgium-Luxembourg 7. |
| Manufactured: | | | |
| Nitrogenous do | 49 | 83 | Belgium-Luxembourg 57; France 10; United Kingdom 10. |

See footnotes at end of table.

## Table 3.—Netherlands: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials—Continued | | | |
| Manufactured—Continued | | | |
| Phosphatic: | | | |
| Thomas slag ($P_2O_5$ content) thousand tons | r 22 | 17 | Belgium-Luxembourg 15. |
| Other ($P_2O_5$ content) ____ do | 20 | 29 | Tunisia 21; Belgium-Luxembourg 5; United States 3. |
| Potassic ____ do | 440 | 403 | West Germany 141; France 69; Belgium-Luxembourg 62. |
| Other, including mixed ____ do | 80 | 97 | West Germany 41; Belgium-Luxembourg 33; France 11. |
| Ammonia | 3,067 | 15,113 | Iran 12,514; Belgium-Luxembourg 2,496. |
| Graphite, natural | 453 | 402 | West Germany 192; People's Republic of China 74; Austria 56. |
| Gypsum and plasters thousand tons | 288 | 303 | West Germany 151; France 143. |
| Lime ____ do | 1,072 | 1,063 | Belgium-Luxembourg 582; West Germany 480. |
| Magnesite | 25,187 | 64,501 | Greece 44,763; Turkey 4,092. |
| Mica: | | | |
| Crude, including splitting and waste | 1,610 | 1,994 | India 628; United Kingdom 568. |
| Worked, including agglomerated splittings | 62 | 68 | Switzerland 19; Belgium-Luxembourg 12. |
| Pigments, mineral: | | | |
| Natural, crude | 965 | 1,110 | Austria 548; West Germany 180; Cyprus 105. |
| Iron oxides, processed | 14,020 | 12,420 | West Germany 11,279. |
| Precious and semiprecious stones, except diamond ____ kilograms | 164,230 | 180,126 | Brazil 132,180; United States 26,075; Republic of South Africa 8,238. |
| Pyrite (gross weight) thousand tons | 43 | 180 | All from U.S.S.R. |
| Salt | 25,133 | 17,137 | West Germany 11,953; France 5,147. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 111,808 | 150,824 | West Germany 77,071; Belgium-Luxembourg 62,409. |
| Caustic potash | 4,172 | 4,688 | Belgium-Luxembourg 2,261; France 2,032. |
| Stone and gravel: | | | |
| Dimension stone: | | | |
| Unworked and partly worked thousand tons | 1,666 | 1,773 | Belgium-Luxembourg 991; Sweden 495; West Germany 239. |
| Worked | 30,600 | 40,631 | Italy 22,609; West Germany 6,615; Portugal 4,064. |
| Dolomite ____ thousand tons | 757 | 799 | Belgium-Luxembourg 736. |
| Gravel and crushed rock ____ do | 13,299 | 13,884 | West Germany 9,161; Belgium-Luxembourg 3,435. |
| Limestone ____ do | 818 | 857 | Belgium-Luxembourg 819. |
| Quartz and quartzite | 32,343 | 32,578 | Norway 15,451; Belgium-Luxembourg 12,645. |
| Sand excluding metal-bearing thousand tons | 7,317 | 7,353 | West Germany 6,769; Belgium-Luxembourg 582. |
| Sulfur: | | | |
| Elemental ____ do | 452 | 454 | United States 320; Poland 77; France 53. |
| Sulfur dioxide | 80 | 147 | West Germany 143. |
| Sulfuric acid, oleum | 139,399 | 196,007 | West Germany 160,903; Belgium-Luxembourg 15,934. |
| Talc and steatite | 13,078 | 14,600 | Norway 5,805; Austria 3,408; France 1,729. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Quartz, electronic grade kilograms | 112 | (5) | NA. |
| Other ____ thousand tons | 2,680 | 2,262 | Belgium-Luxembourg 1,363; West Germany 605; Canada 213. |
| Slag, dross, similar waste, not metal-bearing: | | | |
| From iron and steel manufacture ____ do | 3,109 | 3,117 | West Germany 1,912; Belgium-Luxembourg 993. |
| Slag and ash, n.e.s ____ do | 522 | 765 | West Germany 451; Belgium-Luxembourg 313. |
| Oxides of barium, strontium, magnesium | 1,319 | 1,080 | West Germany 452; United Kingdom 168; United States 144. |

See footnotes at end of table.

Table 3.—Netherlands: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 1,581 | 2,315 | United States 1,232; Belgium-Luxembourg 782; West Germany 298. |
| Carbon black including gas carbon | 10,323 | 11,437 | West Germany 7,618; United Kingdom 2,133; United States 768. |
| Coal and briquets: | | | |
| Anthracite and bituminous coal thousand tons | 3,117 | 3,862 | United States 1,198; West Germany 974; Poland 836. |
| Briquets of anthracite and bituminous do | 2 | 2 | Mainly from Belgium-Luxembourg. |
| Lignite and lignite briquets do | 22 | 20 | All from West Germany. |
| Coke and semicoke do | 982 | 666 | West Germany 579; Belgium-Luxembourg 45. |
| Gas, natural thousand cubic feet | 35 | 109,864 | Belgium-Luxembourg 105,944. |
| Peat, including peat briquets do | 174 | 155 | West Germany 151. |
| Petroleum:[6] | | | |
| Crude thousand 42-gallon barrels | 667,228 | 734,587 | Saudi Arabia 248,912; Iran 154,004; Kuwait 135,352. |
| Refinery products: | | | |
| Gasoline do | 27,115 | 43,358 | U.S.S.R. 10,438; Saudi Arabia 4,872; France 4,394. |
| Kerosine and jet fuel do | 3,527 | 3,396 | Italy 1,052; United Kingdom 882; Belgium-Luxembourg 737. |
| Distillate fuel oil do | 13,861 | 15,606 | United Kingdom 4,745; Spain 2,932; U.S.S.R. 1,686; United States 1,466. |
| Residual fuel oil do | 9,677 | 10,896 | Belgium-Luxembourg 2,550; Italy 2,189; West Germany 1,816. |
| Lubricants do | 3,081 | 2,032 | Belgium-Luxembourg 596; France 313; United Kingdom 309. |
| Mineral jelly and wax do | 159 | 1,273 | West Germany 95; France 84; United Kingdom 36. |
| Bituminous mixtures do | 87 | NA | |
| Liquefied petroleum gas do | 780 | NA | |
| Other do | r 4,495 | 4,047 | Belgium-Luxembourg 1,788; West Germany 1,243; United States 748. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons | 123 | 242 | United States 94; United Kingdom 48; West Germany 46. |

r Revised. NA Not available.
[1] Excludes monetary gold.
[2] Includes spiegeleisen, sponge iron, shot, grit, and pellets.
[3] Imports of bentonite from Belgium-Luxembourg are included with other clay.
[4] Excludes imports from Belgium-Luxembourg which are not reported in source publication.
[5] Less than ½ unit.
[6] Includes bunkers.

## COMMODITY REVIEW

### METALS

**Iron and Steel.**—ESTEL N.V. Hoesch-Hoogovens announced early in 1974 that it planned to spend $65 million at its Ijmuiden complex to increase capacity from the current 6.1 million tons per year to 8 million tons per year by 1978 or 1979. Further details were not reported.

Three of the principal West German steel producers, August Thyssen-Hüettenwerke AG, Mannesmann AG, and Friedr. Krupp GmbH, announced the construction of an iron ore pelletizing plant adjacent to the Maasvlakte bulk transshipment terminal in the Europoort outer harbor at Rotterdam. The facility, estimated to cost $126 million, will have an annual capacity of 4 million tons of pellets. In the first year of operation, the Maasvlakte transshipment facility handled imports of 10.5 million tons of iron ore and coal, principally destined for West Germany, Belgium, and the Netherlands by river and canal shipments. The largest bulk shipment to the European Continent through 1974 involved a 228,000 ton shipment of Brazilian iron ore.

**Zinc.**—Capacity operation of the new zinc refinery of Zinc de la Campine at Budel, originally scheduled for late 1974, was delayed by technical problems. Capacity operation of the 165,000-ton-per-year facility was rescheduled for mid-1976, but may be delayed further by the current oversupply position of zinc in Western Europe.

## NONMETALS

**Fertilizer Materials.**—Production of fertilizer materials reached a record high in 1974 of 1.94 million tons; facilities operated at near capacity. N.V. Zuid Chemie announced that capacity of the new phosphate fertilizer plant at Sas van Gent would be expanded from 280,000 to 390,000 tons per year; completion of the expansion program was scheduled for late in 1975. Dutch State Mines (DSM) announced plans to construct a large fertilizer complex in Limburg Province at a total estimated cost of $670 million. The complex will include a 1,500-ton-per-day ammonia plant, a urea plant, and a 440,000-ton-per-year fertilizer facility. Completion is projected for mid-1978.

The Selective Investment Law was passed by Parliament in 1974 but was not implemented because of the recession. The law provides for licensing and special taxation of fixed investment in the industrialized western sector (the triangle bounded by Amsterdam-Rotterdam-Utrecht). Its purpose is to promote investment in outlying areas currently plagued with unemployment and to avoid further buildup of pollution levels from heavy industry in the crowded industrial sector. Most large chemical complexes are already being planned in Groningen Province in the north or Limburg Province in the south as a result of the Government policy.

## MINERAL FUELS

**Coal.**—Coal production declined 56% in 1974. The last coal mine operated by DSM in Limburg Province closed late in the year. Current indications are that no further coal production will be considered in the near future. However, debate continues in this regard because of the energy-plan proposals indicating the desirability of increasing the amount of coal burned for electrical energy generation. Other features of the energy plan are as follows:

(1) Doubling domestic crude petroleum production from old, onshore fields by secondary recovery methods to meet a goal of 2.8 million tons per year (approximately 10% of domestic consumption);

(2) Constructing three 1,000-megawatt nuclear powerplants by 1985 to provide (with the existing smaller unit) 30% of projected electrical energy needs;

(3) Additional coal imports for power generation, probably from Poland;

(4) Limitation on natural gas exports to levels to be negotiated but not to exceed 45 to 50 billion cubic meters per year or 50% of annual production;

(5) Governmental control of all decisions on electrical power generation;

(6) Deliberate controls to reduce the rate of energy consumption growth to 4.5% annually by 1980 and 2.5% annually by 1985;

(7) Promotion of diesel fuel for automobiles; and

(8) Legislation requiring effective heating insulation on new and old homes and commercial buildings.

**Petroleum**—*Petrochemicals.*—Despite the preceding measures, expansion continued in the petrochemical industry because petrochemical exports are a major revenue source and the products are vital to the domestic economy. DSM announced plans for a large complex in Groningen Province on the Ems River estuary. The complex would include a catalytic cracker with ethylene capacity of 450,000 tons per year and plants for 75,000 tons of polypropylene and 150,000 tons of polyvinyl chloride annually. Projected cost is $370 million; completion is expected by 1980. A second cracker at the existing Geleen site in Limburg Province was also announced with provision for caprolactam expansion to 200,000 tons annually and melamine capacity expansion to 100,000 tons annually.

Shell Nederland Chemie, at the Moerdijk complex, announced a $150 million expansion to provide 330,000 tons of styrene and 125,000 tons of propylene oxide annually from ethylene and benzine feed stocks. Completion is expected in 1978.

Late in the year, the Health Minister announced restrictions on the sulfur content of all fuels as follows: heavy fuel oil, 2.9%; No. 2 heating oil, 0.9%; No. 1 heating oil, 0.7%; and 1.5% maximum

for all other fuels, including coal. The permissible sulfur content was to be further reduced in 1975 and 1976.

**Nuclear.**—During 1974, the first uranium enrichment by the centrifuge method was accomplished by Ultra Centrifuge Nederland N.V. at Almelo. Subsequently, uranium oxide fuel pellets were fabricated and are under test in a commercial reactor.

# The Mineral Industry of New Zealand

By Robert A. Clifton [1]

The value of New Zealand's mineral production increased 31% in 1974 to $172 million.[2] This was the first time it surpassed the $NZ100 million mark. Metals, with nearly an eightfold increase in iron sand production value, climbed to 9.4% of total mineral value. Nonmetallic minerals, with a general increase in value, dropped to 64.9% of the total value. Fuels, with a 38% increase, climbed to 25.7% of the mineral value.

Value of total mineral production by year and the percent contributed by each sector are shown in the following tabulation:

| Year | Percent | | | Total value, million U.S. dollars |
|---|---|---|---|---|
| | Metals | Nonmetals | Fuels | |
| 1972 | r 10.1 | 61.0 | 29.0 | 93.6 |
| 1973 | 1.3 | 76.5 | 22.2 | 131.0 |
| 1974 | 9.4 | 64.9 | 25.7 | 172.1 |

r Revised.

The year 1974 was a year for reevaluation of New Zealand's energy situation and its potential to harm or help the nation's economy. With no domestic capacity, a country that derives 62.5% of its primary energy consumption from oil can be seriously hurt by embargos.

## PRODUCTION

Sand, rock, and gravel (including serpentine and glass sand) was the most valuable category of New Zealand mineral production, with 36% of the value. Cement was next with 20%, followed by iron ore and iron sand at 9%, and limestone at 7%.

[1] Physical scientist, Division of Nonmetallic Minerals.

[2] Unless otherwise indicated, values herein are in U.S. dollars converted from New Zealand dollars at the rate of $NZ1 = US$1.4619.

**Table 1.—New Zealand: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| METALS | | | |
| Aluminum, smelter production | 87,661 | 116,000 | 109,000 |
| Cadmium, mine output, metal content [1] | 14 | 4 | -- |
| Copper, mine output, metal content [2] | 123 | 41 | -- |
| Gold, mine output, metal content [3] troy ounces | 13,511 | 11,044 | 4,710 |
| Iron and steel: | | | |
| Iron ore, gross weight | 141 | 466 | 219 |
| Iron sands, gross weight [4] | 1,380,328 | 2,181,164 | 2,352,653 |
| Sponge iron [e] thousand tons | 100 | 100 | 125 |
| Crude steel do | r 66 | 100 | 150 |
| Lead, mine output, metal content [2] | 1,155 | 328 | -- |
| Silver, mine output, metal content [2] troy ounces | 31,290 | 49,181 | 1,814 |
| Tungsten, mine output, metal content | r 10 | e 1 | 5 |
| Zinc, mine output, metal content [2] | 1,653 | 1,291 | -- |
| NONMETALS | | | |
| Cement, hydraulic thousand tons | 899 | 1,058 | 1,068 |
| Clays: | | | |
| Bentonite | 620 | 1,031 | 5,069 |
| Fire clay | 206,496 | 210,021 | 275,389 |
| Kaolin (including china clay) | 9,489 | 9,218 | 16,711 |

See footnotes at end of table.

Table 1.—New Zealand: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Diatomite | r 4,917 | 4,501 | 4,558 |
| Kauri gum | 12 | 10 | e 8 |
| Magnesite | 960 | 1,155 | 826 |
| Perlite | 2,540 | 1,599 | 465 |
| Pumice | 129,611 | 56,909 | 70,328 |
| Salt | 59,438 | 101,500 | 54,864 |
| Sand and gravel: | | | |
| Glass sand | r 110,075 | 124,405 | 148,663 |
| Common sand and gravel[5] thousand tons | r 27,817 | 29,291 | 28,024 |
| Stone:[5] | | | |
| Dolomite | 11,875 | 15,713 | 20,935 |
| Greenstone | 5 | 4 | 6 |
| Limestone: | | | |
| For agriculture thousand tons | 1,541 | 1,698 | 1,540 |
| For industry, except cement do | 123 | 238 | 248 |
| For cement do | 1,467 | 1,783 | 1,884 |
| Serpentine do | 96 | 74 | 89 |
| Unspecified: | | | |
| Dimension | 23,407 | 36,547 | 35,085 |
| Rock for harbor work thousand tons | 625 | 803 | 2,132 |
| Sulfur | -- | -- | 224 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon dioxide, natural (produced with natural gas) million cubic feet | 4,993 | 5,485 | 6,667 |
| Coal: | | | |
| Bituminous thousand tons | 382 | 422 | 422 |
| Subbituminous do | 1,647 | 1,902 | 1,998 |
| Lignite do | 152 | 145 | 144 |
| Total do | 2,181 | 2,469 | 2,564 |
| Coke: | | | |
| Metallurgical do | r 5 | -- | -- |
| Gashouse do | 22 | 27 | 31 |
| Fuel briquets do | 13 | 15 | 3 |
| Gas, natural:[6] | | | |
| Gross production million cubic feet | 7,491 | 9,339 | 10,429 |
| Marketed production do | e 7,116 | 9,292 | e 10,380 |
| Natural gas liquids thousand 42-gallon barrels | e 10 | 9 | 25 |
| Petroleum: | | | |
| Crude[7] do | r 1,119 | 1,290 | 1,385 |
| Refinery products: | | | |
| Gasoline do | 11,042 | 9,527 | 10,783 |
| Distillate fuel oil do | 5,029 | 4,563 | 4,578 |
| Residual fuel oil do | 7,536 | 8,787 | 9,607 |
| Other do | 784 | 641 | 763 |
| Refinery fuel and losses do | 1,769 | 1,806 | 2,167 |
| Total do | 26,160 | 25,324 | 27,898 |

e Estimate. p Preliminary. r Revised.
[1] Contained in zinc concentrate.
[2] Contained in lead-copper concentrate.
[3] Includes that contained in lead-copper concentrate.
[4] Average 60% iron.
[5] Crushed rock for building aggregate, roads and ballast is included with sand and gravel.
[6] Excludes carbon dioxide component of natural gas, which is reported separately.
[7] Actually field condensate except for 1,000 barrels in 1972.

## TRADE

The only major export product of a mineral nature from New Zealand is the titanomagnetite iron sands. A total of 1,179,904 tons was shipped to Japan in 1974 by Waipipi Iron Sands Ltd. from their dredging operations near Waverly. New Zealand Steel Mining Ltd. was producing and exporting from Taharoa. Both companies and operations had handled better than 3,500,000 long dry tons of ore during a 30-month period.

The major mineral import was Australian alumina to be processed at the Bluff smelter of New Zealand Aluminum Smelters Ltd.

Subject to government approval, West Coast Resources Ltd. announced plans to mine and export 7.5 million tons of coal from the Mt. Davy, Greymouth area of South Island.

## Table 2.—New Zealand: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal and alloys: | | | |
| Scrap | 1,173 | 2,252 | Australia 2,142. |
| Unwrought and semimanufactures | 62,066 | 91,589 | Japan 84,482; Hong Kong 3,956. |
| Copper metal and alloys: | | | |
| Scrap | 818 | 903 | Australia 769. |
| Unwrought and semimanufactures | 2,440 | 1,536 | Australia 1,307. |
| Iron and steel: | | | |
| Ore and concentrate thousand tons | 990 | 1,960 | All to Japan. |
| Metal: | | | |
| Scrap | 2,801 | 3,505 | Japan 2,680. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 4,142 | 6,395 | Fiji 2,779; New Hebrides 1,832. |
| Universals, plates, sheets | 41,030 | 77,385 | United States 58,866; Pakistan 3,996. |
| Wire | 1,003 | 692 | NA. |
| Tubes, pipes, fittings | 589 | 976 | Oceania 871. |
| Lead: | | | |
| Ore and concentrate | 2,138 | 1,464 | Japan 1,461. |
| Metal and alloys, unwrought and semimanufactures | 200 | 176 | NA. |
| Platinum-group metals and silver ores value, thousands | $78 | NA | |
| Zinc ore and concentrate | 3,332 | 2,458 | All to Japan. |
| Other, ash and residue containing nonferrous metals value, thousands | $157 | $653 | Australia $221; Oceania $221; United Kingdom $186. |
| NONMETALS | | | |
| Cement | 7,245 | 12,897 | Oceania 12,896. |
| Clays and clay products, including all refractory brick value, thousands | $227 | $398 | Oceania $369. |
| Precious and semiprecious stones, except diamond value, thousands | $117 | $64 | Australia $61. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal and coke, including briquets value, thousands | $434 | NA | |
| Petroleum refinery products: | | | |
| Gasoline thousand 42-gallon barrels | 6 | 2 | NA. |
| Kerosine do | 514 | 386 | NA. |
| Distillate fuel oil do | 1,200 | 996 | All to ship stores. |
| Residual fuel oil do | 1,324 | 1,103 | Do. |
| Lubricants value, thousands | $755 | $316 | Ship stores $259. |
| Other thousand 42-gallon barrels | 5 | NA | |

NA Not available.

## Table 3.—New Zealand: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Oxides and hydroxides | 165,760 | NA | |
| Metals and alloys: | | | |
| Unwrought | 5,179 | 2,823 | Australia 2,678. |
| Semimanufactures | 4,961 | 4,491 | Australia 2,566; United States 800. |
| Chromium oxides and hydroxides | 213 | NA | |
| Copper metal and alloys: | | | |
| Unwrought | r 647 | 1,279 | Australia 1,124. |
| Semimanufactures value, thousands | $14,085 | $27,505 | Australia $20,091; United Kingdom $4,022. |
| Iron and steel: | | | |
| Pig iron, including cast iron | 3,996 | 4,180 | All to Australia. |
| Sponge iron, powder and shot | 582 | 970 | NA. |
| Scrap | 17,275 | 34,219 | Mainly from United States. |
| Ferroalloys | 3,044 | 2,873 | NA. |
| Steel, primary forms | 17,278 | 23,851 | Australia 11,422; Japan 6,051; Belgium-Luxembourg 3,749. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 77,669 | 110,657 | Australia 60,445; Japan 29,380. |
| Universals, plates, sheets | 288,752 | 349,510 | Japan 260,002; Australia 50,963. |
| Hoop and strip | 14,186 | 18,492 | Japan 9,459; Australia 5,697. |

See footnotes at end of table.

## Table 3.—New Zealand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Semimanufactures—Continued | | | |
| Rails and accessories | 7,848 | 13,399 | Australia 12,247; United Kingdom 896. |
| Wires | 18,292 | 28,245 | United Kingdom 11,384; Japan 7,562. |
| Tubes, pipes, fittings | 25,972 | 34,339 | Australia 20,719; United Kingdom 6,425. |
| Castings and forgings, rough | 107 | 525 | Australia 359; United Kingdom 164. |
| Lead: | | | |
| Oxides | 390 | NA | |
| Metal and alloys: | | | |
| Unwrought | 6,892 | 6,762 | All from Australia. |
| Semimanufactures | | | |
| value, thousands | $12 | NA | |
| Magnesium, metal, unwrought | 113 | NA | |
| Manganese oxides | 677 | NA | |
| Mercury 76-pound flasks | 203 | NA | |
| Nickel metal, including alloys: | | | |
| Unwrought | 75 | 207 | Canada 185. |
| Semimanufactures | 174 | 232 | United Kingdom 137; Australia 56. |
| Platinum-group metals and silver metal including alloys: | | | |
| Platinum group | | | |
| value, thousands | $94 | $152 | NA |
| Silver do | $695 | $1,435 | Australia $1,295. |
| Tin: | | | |
| Oxides long tons | 13 | NA | |
| Metals, including alloys: | | | |
| Unwrought do | 326 | 256 | Australia 246. |
| Semimanufactures do | 19 | 123 | Australia 105. |
| Titanium oxides | 2,116 | NA | |
| Zinc metal and alloys: | | | |
| Unwrought | 18,723 | 20,304 | All from Australia. |
| Semimanufactures | 310 | 766 | Do. |
| Other: | | | |
| Ore and concentrate | 586 | 1,062 | NA. |
| Oxides, hydroxides and peroxides of metals, n.e.s | 113 | 3,832 | Australia 1,573; Japan 939; West Germany 645. |
| NONMETALS | | | |
| Asbestos | 6,552 | 8,812 | Canada 7,155. |
| Barite | 1,357 | NA | |
| Cement | 1,357 | 5,105 | Japan 2,950; United Kingdom 1,510. |
| Chalk | 741 | NA | |
| Clays and clay products: | | | |
| Crude | 6,324 | NA | |
| Products value, thousands | $1,775 | $2,954 | United Kingdom $1,428; Australia $603. |
| Diamond: | | | |
| Gem, not set or strung do | $1,151 | $2,128 | United Kingdom $503. |
| Industrial do | r $50 | $53 | NA. |
| Diatomite and other infusorial earth | 930 | NA | |
| Feldspar, fluorspar and nepheline syenite | 1,871 | 355 | Norway 114. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 935 | NA | |
| Phosphatic thousand tons | 1,075 | 1,175 | Nauru 509; Australia 388. |
| Manufactured: | | | |
| Nitrogenous | | | |
| value, thousands | $3,844 | $9,615 | Japan $6,452; Netherlands $1,310. |
| Phosphatic, including basic slag | 5,017 | 14,201 | Belgium-Luxembourg 6,968; Australia 5,589. |
| Potassic | 218,449 | 312,577 | United States 209,598; Canada 67,537. |
| Gypsum and plasters | 111,505 | NA | |
| Pigments, mineral, including processed iron oxides | 1,058 | NA | |
| Precious and semiprecious stones, except diamond value, thousands | $549 | $1,240 | Australia $680; West Germany $207. |
| Salt and brine | 25,524 | 45,227 | Australia 22,309; United Kingdom 21,355. |
| Sodium and potassium compounds, n.e.s | 12,642 | NA | |

See footnotes at end of table.

Table 3.—New Zealand: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel: | | | |
| Dimension stone | 696 | NA | |
| Quartz and quartzite | 972 | NA | |
| Other, unspecified | -- | 187,645 | Australia 185,851. |
| Sulfur, elemental, all forms | 217,878 | 224,716 | Canada 166,191; United States 51,429. |
| Talc, steatite, soapstone and pyrophyllite | 2,239 | NA | |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon, black, and gas carbon | 6,620 | NA | |
| Coal and coke, including briquets | NA | 3,690 | Australia 3,119; United States 571. |
| Gas, hydrocarbon -- value, thousands | $226 | $201 | Australia $136. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 23,856 | 6,524 | Iran 3,244; Saudi Arabia 1,386. |
| Refinery products: | | | |
| Gasoline do | 2,405 | 3,306 | Australia 1,713; Bahrain 819. |
| Kerosine and jet fuel do | 1,581 | 2,056 | Australia 1,222; Iran 383. |
| Distillate fuel oil do | 1,785 | 2,450 | Australia 1,230; Bahrain 537. |
| Residual fuel oil do | 73 | NA | |
| Lubricants value, thousands | $5,410 | $7,305 | Australia $5,007; United Kingdom $717. |
| Other: | | | |
| Petroleum coke thousand 42-gallon barrels | (1) | NA | |
| Mineral jelly and wax do | 29 | 34 | Japan 15; Indonesia 7. |
| Unspecified do | 129 | NA | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals value, thousands | $511 | $5,727 | United States $3,897; Australia $1,464. |

r Revised. NA Not available.
1 Value only reported at $1,686,000.

## COMMODITY REVIEW

### METALS

**Aluminum.**—The Bluff smelter plan to expand initial capacity from 110,000 long tons per year to 150,000 long tons got underway early in 1974. Completion was scheduled for early 1976. The New Zealand Government disapproved a proposal by Otago Metal Industries Ltd. for a second aluminum smelter at Aramoana on Otago harbor. The rejection was based on the proposition that because the aluminum would be exported, this would virtually be an exportation of energy at an inappropriate time.

**Gold.**—New Zealand's South Island was the center of the search for gold deposits, but no major finds were reported. Dredging by Kanieri Gold Dredging Ltd. on the Taramakua River ceased in October 1974, but may resume. Gold production volume in 1974 was less than half of that of 1973.

**Iron and Steel.**—Waipipi Iron Sands maintained full production at Waipipi during 1974. New Zealand Steel Mining continued its export operation at Taharoa, and increased its operation at Waikato North Head to supply the demands of an enlarged Glenbrook steelworks.

The 1973 and 1974 data for Glenbrook show iron production up 64%, steel billets up 29%, galvanizing line products up 6%, and pipe products up 120%. Production figures in tons are as follows:

| | 1973 | 1974 |
|---|---|---|
| Iron and concentrate | 649,576 | 1,210,049 |
| Iron | 62,570 | 102,569 |
| Steel billets | 83,772 | 108,080 |
| Galvanizing line products | 129,422 | 137,602 |
| Pipe products | 16,793 | 36,968 |

Process costs have been reduced by a new technology that permits direct iron sand feed without the prior need to pelletize.

**Molybdenum.**—Drilling was started by New Zealand Cities Service Ltd. on the Taipo molybdenum prospect in northwest Nelson. Cities Service is associated with Lime and Marble Ltd. of Nelson on this project.

**Silver.**—The volume of silver produced in 1974 was just 37% of that in 1973.

### NONMETALS

**Asbestos.**—Cassiar Asbestos Corporation Ltd. of Canada has abandoned its exploration program of the Pyke Asbestos property,

West Coast, South Island. Reserves were reportedly too little for economic viability.

**Feldspar.**—The feasibility of producing sodium feldspar from beach sand deposits on the east coast of Northland was under study.

## MINERAL FUELS

**Coal.**—Coal has been contributing 16.5% of the primary energy needs of New Zealand, but it is due to replace oil in many areas in the near future. The 2.6 million tons produced in 1974 represented a 4% increase over that of 1973.

The Huntley powerstation being built in the Waikato Valley will be New Zealand's largest and produce 40% more electricity in 1981 than is currently provided by the eight nearby hydro stations. It will be powered by subbituminous coal from newly discovered deposits in the valley that now have a proved 150-million-ton reserve with exploratory drilling still being done. With several other finds in the Huntley District available, the government-owned State Coal Mines plans to double its output by opening three new mines whose output will eventually total more than 2 million tons per year. Eighty percent of the output is scheduled to go to the Huntley powerstation.

Sufficient coking coal exists for New Zealand's steel industry and there are 13 plants making producer gas, mainly on South Island.

**Natural Gas.**—Natural gas, at present only from the Kapuni Field, provides a nominal 3% of the country's energy needs. Industry and commerce get about 58% of the available gas, homes 8%, and 34% is reserved for the Otahuhu gas turbine generator and the new New Plymouth powerstation. The latter will be supplied from Kapuni only until gas from the new Maui Field is available. A third gas treatment plant will increase Kapuni capacity in 1976.

Of the Government share of the Maui Field gas, 60% is destined for the New Plymouth, Auckland, and Huntley powerstations, and 10% for industry. The remainder will go for fuel, another powerstation, or as feedstock for a petrochemical complex.

The condensate from both fields will replace some of the oil for New Zealand's transportation industry.

## ENERGY

**General.**—New Zealand has some real, but not insurmountable, problems in the energy area. Contrary to what might be expected from a country with a largely pastoral economy, it has a larger than average per capita energy consumption that has grown at an average of 3.7% per year since 1951. Oil, not a domestic product, is the primary source accounting for 62.5% of the total energy consumed and is the basis of the problem. Hydroelectric power provided 18%, coal 16.5%, and natural gas 3% of energy consumption.

About two-thirds of the oil supply is used in internal combustion engines, and oil provides one-third of the energy for industry and commerce, all the energy for the transportation industry, a direct 9.5% of the home energy, and some portion of the electricity that supplies 73% of the energy used in homes. Fifty-eight percent of the thermally produced electricity came from oil burning generators. During the 3-month period ending in March 1974, oil costs increased 91%.

**Geothermal.**—During the 5-year period between 1958 and 1963, 13 geothermal wells were brought on-stream. These units produced 8% of the country's electricity needs in 1971–72. The Broadlands geothermal field is being assessed and the first of four wells has been brought in with very promising results. A 150-megawatt powerstation is in the planning stage as is a low-boiling-point binary system which could increase the Warakei station from 165 megawatts to 190 megawatts.

**Hydropower.**—In 1971, hydropowered generators provided about 85% of the electricity consumed in New Zealand. The shortage of rainfall over the last few years has reduced this capacity. Hydropower's share of electricity-generating capacity is expected to be only 64% in 1981 as coal and natural gas plants come on-stream. Conservationist resistance to some proposed hydroelectric schemes has been effective, but production at the eight stations on the Waikato River will be increased 18% by the Tongariro scheme.

**Nuclear Energy.**—The high initial costs and environmental opposition have combined to delete consideration of nuclear energy as a source for the near future.

# The Mineral Industry of Nigeria

By Keith L. Harris [1]

The importance of the petroleum sector to the Nigerian economy continued to be overwhelming in 1974. Increased production combined with a price boost from $8.310 [2] per barrel to $14.691 per barrel resulted in petroleum providing 93% of export earnings, 92% of foreign exchange earnings, about 90% of government revenues, and 45% of the gross domestic product (GDP). Total output reached 823 million barrels, making Nigeria the world's sixth largest oil producer, and second leading supplier of crude oil to the United States.

GDP in 1974 dollars increased 9.7%, the favorable balance of trade reached $6.6 billion, and foreign exchange reserves climbed to $5.6 billion.

Inflation rose at a high rate during the year, mostly due to increased costs of imports. The Government decreased tariff and excise duties on many raw materials and consumer goods during the year. To further reduce the cost of imports, the naira was revalued upwards 7% against the dollar.

Under the Indigenization Decree of early 1972, selected commercial, service, and light manufacturing activities had to have full or partial (40%) Nigerian equity participation. By April 1, 1974, the effective date, most of the stipulated industries had complied. Along with indigenization of other sectors of the economy, the Government continued its objective of increased public participation in oil production by acquiring 55% equity in all oil producing companies in Nigeria at a cost to the Government of $1.7 billion.

## PRODUCTION

Petroleum continued to dominate Nigeria's mineral output during 1974. Total production was up 8% from that of 1973, to 823 million barrels. Refinery production stabilized as the nation's one plant reached capacity. Gross natural gas output was up 38% from the 1973 level, but marketed production was less than 2% of gross production. Tin mine and smelter production decreased 6% and 7%, respectively, from the 1973 levels. Production of most other minerals declined.

[1] Physical scientist, Division of Nonferrous Metals.
[2] Where necessary, values have been converted from Nigerian naira (N) to U.S. dollars at the rate of N1.00=US$1.62.

Table 1.—Nigeria: Production of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| METALS | | | | |
| Columbium and tantalum: | | | | |
| Columbite concentrate, gross weight | | r 1,361 | 1,240 | 1,193 |
| Tantalite concentrate, gross weight | | 1 | 1 | 1 |
| Gold | troy ounces | 13 | 21 | 6 |
| Lead, mine output, metal content | | 321 | 356 | 219 |
| Rare-earth metals, monazite concentrate | | 10 | 5 | 11 |
| Tin: | | | | |
| Mine output, cassiterite concentrate: | | | | |
| Gross weight | long tons | r 8,905 | 7,759 | 7,255 |
| Tin content | do | r 6,590 | 5,742 | 5,369 |
| Smelter | do | 6,637 | 5,889 | 5,486 |
| Tungsten ore and concentrate, gross weight | | 1 | 3 | (1) |
| Zinc, ore and concentrate, metal content | | -- | -- | e 65 |
| NONMETALS | | | | |
| Cement, hydraulic | thousand tons | r 1,112 | 1,222 | 1,238 |
| Clays, unspecified | | 8,768 | 29,988 | 16,747 |
| Feldspar | | 4,313 | e 5,000 | e 5,000 |
| Stone: | | | | |
| Limestone | thousand tons | 1,189 | 1,801 | 1,655 |
| Marble | | 757 | 8,631 | 4,240 |
| Shale | thousand tons | 114 | 133 | 198 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Coal | do | r 341 | 327 | 278 |
| Gas, natural: | | | | |
| Gross production | million cubic feet | r 604,620 | 735,813 | 1,017,774 |
| Marketed production | do | r 9,641 | 10,700 | 14,255 |
| Petroleum: | | | | |
| Crude | thousand 42-gallon barrels | r 673,702 | 760,592 | 823,385 |
| Refinery products: | | | | |
| Gasoline | do | 4,389 | 5,588 | 5,301 |
| Jet fuel | do | -- | 1,573 | 709 |
| Kerosine | do | 2,361 | 1,574 | 2,209 |
| Distillate fuel oil | do | 4,093 | 4,881 | 4,767 |
| Residual fuel oil | do | 4,976 | 6,100 | 6,487 |
| Liquefied petroleum gas | do | 104 | 174 | 160 |
| Refinery fuel and losses | do | 292 | 959 | 820 |
| Total | do | 16,215 | 20,849 | 20,453 |

e Estimate. p Preliminary. r Revised.
1 Less than ½ unit.

## TRADE

Nigeria's foreign trade continued to grow in 1974. Exports increased 155% while imports increased only 42%, resulting in an overall rise in the favorable balance of trade to $6.55 billion in 1974, a 288% increase over the 1973 trade surplus. Total value of exports was $9.37 billion. Imports rose from $1.98 billion in 1973 to $2.81 billion in 1974.

As in the past, exports of petroleum dominated Nigerian trade. A modest 2% increase in tonnage shipped was magnified by a 177% increase in unit value resulting in about a twofold increase in total export value. Petroleum exports accounted for 93% of the total export value. Tin exports remained about the same as in 1973, but increased tin prices caused a 70% rise in export value to $43 million.

The United States continued as the leading purchaser of Nigerian exports. The value of shipments to the United States totaled $2.57 billion, up 188% from the 1973 level, and accounted for 27% of Nigeria's exports. Nigeria's imports from the United States totaled $345 million.

## Table 2.—Nigeria: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Columbium and tantalum, ore and concentrate | 1,486 | 1,145 | United Kingdom 683; Japan 231; Netherlands 107. |
| Iron and steel metal, scrap | 911 | 282 | Netherlands 148; Brazil 90; Belgium-Luxembourg 38. |
| Lead, ore and concentrate, gross weight | 173 | 314 | United Kingdom 193; West Germany 121. |
| Tin metal including alloys, all forms long tons | 6,741 | 5,251 | United Kingdom 4,592; Netherlands 659. |
| Tungsten, ore and concentrate | -- | 1 | All to Netherlands. |
| Zinc: | | | |
| Ore and concentrate, gross weight | 299 | 110 | All to France. |
| Metal including alloys | -- | 20 | Do. |
| Other nonferrous base metals, n.e.s.: | | | |
| Ore and concentrate, gross weight | 212 | 1,955 | Spain 1,116; Netherlands 717. |
| Scrap | 3,103 | 3,769 | Netherlands 955; Belgium-Luxembourg 831; West Germany 796. |
| NONMETALS | | | |
| Abrasives, grinding and polishing wheels and stones | -- | (1) | NA. |
| Fertilizer materials, crude | 31 | 6 | Dahomey 5; Sierra Leone 1. |
| Stone, sand and gravel | -- | 46 | All to United Kingdom. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 5 | 457 | Spain 275; Niger 106. |
| Coal and coke, including briquets | 19,102 | 25,541 | Ghana 23,884; Sierra Leone 1,657. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 781,787 | 698,779 | United States 181,731; United Kingdom 111,124; France 99,925. |
| Refinery products: | | | |
| Gasoline do | 80 | 468 | United States 391; Equatorial Customs Union [2] 45. |
| Jet fuel do | 185 | 197 | United Kingdom 120; Equatorial Customs Union [2] 58. |
| Kerosine do | 18 | 11 | Equatorial Customs Union [2] 8; Niger 3. |
| Distillate fuel oil do | 172 | 414 | United States 133; Niger 104; Equatorial Customs Union [2] 60. |
| Residual fuel oil do | 488 | 1,095 | United States 749; Netherlands Antilles 291. |
| Lubricants do | 3 | 7 | Ghana 4; Dahomey 1. |
| Bitumen and bituminous mixtures, n.e.s do | 1 | 127 | Dahomey 125. |
| Total do | 947 | 2,319 | |

NA Not available.
[1] Less than ½ unit.
[2] Consists of Congo, Central African Republic, Chad and Gabon.

## Table 3.—Nigeria: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum metal and alloys: | | | |
| Unwrought | 110 | 350 | West Germany 226; Italy 48; United Kingdom 37. |
| Semimanufactures | 7,634 | 8,355 | Switzerland 2,756; United Kingdom 2,107; Italy 875. |
| Copper metal and alloys: | | | |
| Unwrought | 9 | 27 | United Kingdom 25; West Germany 2. |
| Semimanufactures | 1,877 | 2,905 | United Kingdom 1,240; Belgium-Luxembourg 713; Canada 645. |
| Iron and steel: | | | |
| Ore and concentrates including roasted pyrites, gross weight | 3,935 | 3,920 | Sweden 3,912; Ghana 8. |
| Metal: | | | |
| Scrap | 6 | 1 | Mainly from Netherlands. |
| Pig iron, including cast iron | 883 | 185 | United Kingdom 118; Italy 54. |
| Sponge iron, including powder and shot | 59 | 51 | United Kingdom 39. |
| Spiegeleisen | 224 | (1) | All from United Kingdom. |
| Ferroalloys, other | 11 | 160 | France 72; Belgium-Luxembourg 36; Poland 26. |
| Steel, primary forms | 47,787 | 85,928 | West Germany 40,514; United States 22,774; United Kingdom 8,765. |
| Semimanufactures | 499,649 | 656,257 | Japan 178,008; United Kingdom 141,955; West Germany 122,047. |
| Lead metal including alloys: | | | |
| Unwrought | 848 | 808 | United Kingdom 795. |
| Semimanufactures | 52 | 230 | Belgium-Luxembourg 81; United Kingdom 78; Poland 40. |
| Nickel metal including alloys: | | | |
| Unwrought | (1) | 1 | Mainly from Czechoslovakia. |
| Semimanufactures | 77 | 37 | West Germany 21; United Kingdom 15. |
| Platinum-group metals and silver: | | | |
| Ore and concentrate, gross weight | 2 | -- | |
| Metals including alloys, all forms: | | | |
| Platinum group thousand troy ounces | 11 | (1) | Mainly from United Kingdom. |
| Silver do | 877 | 2 | Do. |
| Tin metal including alloys: | | | |
| Unwrought long tons | 462 | 7 | All from United Kingdom. |
| Semimanufactures do | 296 | 60 | United Kingdom 29; India 21; West Germany 9. |
| Uranium and thorium metal including alloys, all forms | -- | 1 | All from United Kingdom. |
| Zinc metal including alloys: | | | |
| Unwrought | 5,682 | 4,763 | Zaire 3,333; United Kingdom 1,420. |
| Semimanufactures | 253 | 57 | United Kingdom 34; France 12; Japan 6. |
| Other: | | | |
| Ore and concentrate of base metals, n.e.s | 1,657 | 223 | United Kingdom 173; West Germany 46. |
| Oxides, hydroxides and peroxides of metals, n.e.s | 1,608 | 2,969 | United Kingdom 1,909; West Germany 352. |
| Metals, nonferrous, including alloys, all forms, n.e.s | 1,107 | 13,328 | West Germany 4,848; Zaire 1,856. |
| **NONMETALS** | | | |
| Abrasives: | | | |
| Natural | 667 | 6,280 | Greece 5,906. |
| Grinding and polishing wheels and stones | 474 | 424 | United Kingdom 182; Italy 92; West Germany 63. |
| Asbestos | 37,234 | 32,190 | Canada 23,935. |
| Cement, hydraulic | 720,111 | 854,549 | U.S.S.R. 187,436; Turkey 123,877; Angola 111,609. |
| Clays and clay products (including all refractory products) | 11,131 | 10,166 | United Kingdom 4,152; West Germany 1,705; United States 950. |
| Diamond, industrial - value, thousands | $21 | $2 | Mainly from India. |

See footnote at end of table.

**Table 3.—Nigeria: Imports of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials: | | | |
| Crude | 6,125 | 23,784 | West Germany 17,283; Belgium-Luxembourg 3,268; Netherlands 2,356. |
| Manufactured: | | | |
| Nitrogenous | 32,892 | 8,515 | West Germany 7,805. |
| Phosphatic | 25,908 | 40,902 | United Kingdom 25,002; Netherlands 7,237; West Germany 4,375. |
| Potassic | 3,968 | 10,767 | People's Republic of China 9,071; West Germany 1,003. |
| Other, n.e.s | 14,130 | 776 | West Germany 324; United States 127; Belgium-Luxembourg 101. |
| Ammonia | 434 | 737 | West Germany 413; United Kingdom 220. |
| Lime | 38,415 | 16,015 | United Kingdom 13,195; West Germany 2,611. |
| Mica, all forms | 908 | 561 | Japan 247; France 187. |
| Pigments, mineral, including processed iron oxides | 1,608 | 2,969 | United Kingdom 1,909; West Germany 352. |
| Precious and semiprecious stones, except diamond, value, thousands | $16 | $124 | India $120. |
| Salt, excluding brine | 156,187 | 200,586 | United Kingdom 127,526; Poland 41,384; United Kingdom 25,242. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 13,978 | 16,571 | West Germany 7,058; United Kingdom 6,214; Italy 2,548. |
| Caustic potash, sodic and potassic peroxides | 6,310 | 4,213 | United Kingdom 1,877; West Germany 1,371; Sweden 328. |
| Stone, sand and gravel: | | | |
| Worked | 284 | 6,775 | Italy 5,469; Brazil 1,000. |
| Gravel and crushed rock | 50,114 | 34,191 | Morocco 30,359; France 2,564. |
| Sulfur, all types, other than sublimed | 311 | 457 | All from United Kingdom. |
| Other nonmetals, n.e.s | 6,508 | 217 | West Germany 162; United Kingdom 34. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 68,875 | 234,041 | United Kingdom 86,994; Greece 35,018; Morocco 34,046. |
| Coal and coke, including briquets | 1,448 | 1,703 | West Germany 1,607. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | -- | 22 | All from United Kingdom. |
| Refinery products: | | | |
| Gasoline do | 390 | 509 | Netherlands Antilles 148; United Kingdom 144; Italy 49. |
| Kerosine do | 104 | 84 | Netherlands Antilles 21; Netherlands 18. |
| Jet fuel do | 49 | 135 | Netherlands 40; Netherlands Antilles 23; Italy 19. |
| Distillate fuel oil do | 22 | 51 | Netherlands Antilles 34; Iran 12. |
| Residual fuel oil do | -- | 9 | Mainly from Netherlands Antilles. |
| Lubricants do | 224 | 280 | United Kingdom 68; Netherlands Antilles 59; Italy 46. |
| Other: | | | |
| Mineral jelly and wax do | 29 | 73 | Netherlands 51; West Germany 11. |
| Bitumen and bituminous mixtures do | 416 | 2,494 | Netherlands 942; United Kingdom 278. |
| Unspecified do | 12 | 14 | Netherlands 9; United Kingdom 3. |
| Total do | 1,246 | 3,649 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 2,700 | 43,908 | United States 25,010; United Kingdom 18,872. |

[1] Less than ½ unit.

## COMMODITY REVIEW

**Metals.**—*Tin.*—Production of tin in Nigeria declined for the 6th consecutive year to 5,369 long tons in 1974, the lowest level since 1934. Over the past several years, spiraling production costs have lowered the profit margin of operators to a point where significant reinvestment and exploration programs had to be curtailed, forcing rapid depletion of minable ore bodies. Decreased royalties and high prices through the middle of 1974 gave operators a much needed opportunity to make a profit.

Amalgamated Tin Mines of Nigeria Ltd., Nigeria's largest producer, increased profits to $4.35 million during its fiscal year ending March 1974, compared with $0.99 million in 1973. Over $1.5 million of the profits was invested in much needed earth moving equipment—two bucket wheel excavators—to begin operating in 1975. The investment, one of the largest in the Nigerian tin industry in many years, could be a precursor to increasing mechanization of Nigerian tin mining as increasing labor costs force mechanization if the mines are to remain competitive in the international market.

**Mineral Fuels.**—*Natural Gas.*—Production of natural gas in association with crude oil averaged 2.8 billion cubic feet per day in 1974, a 38% increase over the 2.0-billon-cubic-foot-per-day average for 1973. About 99% of the output was flared at the wellhead. The remainder was used by petroleum companies to generate electric power for their own needs, reinjected into wells, or sold to industrial consumers, including the Nigerian Electric Power Authority for power generation. Early in the year, Gulf Oil Company (Nigeria) Ltd. proposed to build a $1 billion plant to process 500 million cubic feet per day of gas for export as liquefied natural gas. At yearend the Government was still discussing the Gulf proposal as well as those of three other companies.

*Petroleum.*—Petroleum output continued to increase through June when it peaked at 2.34 million barrels per day. Declining world demand and government induced production cutbacks reduced output to 2.06 million barrels per day by December. Total production reached 823 million barrels. Exports of crude, at 719 million barrels, were up 3% from the 1973 level. The United States, which received 29% of the exports, continued to be the largest market for Nigerian crude oil. Deliveries to the Nigerian Petroleum Refining Co., Ltd.'s Port Harcourt refinery totaled 20.9 million barrels and the refinery worked at capacity. The refinery capacity reportedly will be expanded to 75,000 barrels per day in 1975.

Effective April 1, the Government-owned Nigerian National Oil Co. (NOC) acquired 55% interest in all the producing companies—The Shell-BP Petroleum Development Co. of Nigeria Ltd.; Gulf; Mobil Exploration Nigeria Ltd.; Nigerian AGIP Oil Company Ltd.-Phillips Petroleum Company (Nigeria) Ltd.; Elf-Nigeria Ltd. (formerly Safrap (Nigeria) Ltd.); and Texaco Overseas (Nigeria) Petroleum Company–Chevron Oil Co. (Nigeria). NOC gave the companies the right to buy back half of NOC's production at $13.00 per barrel plus an option on half of the remaining oil at $13.25 a barrel compared with the posted price of $14.691. The prices were subject to quarterly review. The availability of NOC oil to the companies would decrease from January 1975 through January 1976 until the companies would have only their 45% equity oil and no buy-back privileges. NOC retained its 51% ownership of nonproducing offshore exploration firms—Occidental Petroleum Nigeria, Deminex (Nigeria) Ltd., and Japan Petroleum Co. (Nigeria) Ltd.

In May, the Government ordered Texaco-Chevron to cease production at its offshore Pennington Field indefinitely because the 4,000-barrel-per-day production rate was uneconomic. Texaco-Chevron continued exploration and expansion of production facilities with a 25,000-barrel-per-day production rate expected by mid-1975 from the Pennington Field, and the undeveloped Apoi and Middleton Fields.

Late in the year, the Government ordered the two largest producers to cut production. Shell-BP, Nigeria's largest producer, was ordered to cut production to 1.3 million barrels per day. Gulf reduced production about 150,000 barrels per day, to 230,000 barrels per day. Production of crude oil and associated natural gas for the five active producing companies during December is given in table 4.

Ashland Oil (Nigeria) Co., which has

a 35% interest in a production-sharing agreement with NOC, discovered two oilfields at its onshore tract south of Oguta Lake in East Central State. The Ossu discovery well flowed at a combined rate of 4,000 barrels per day from two zones. At the Izombe Field, 4 miles east of the Ossu Field, one well tested at a combined rate of 4,900 barrels per day of high-gravity, low-sulfur crude oil from multiple zones. Another well tested at the rate of 3,475 barrels per day from two zones. Initial production of 12,000 barrels per day rising to 20,000 barrels per day was expected in 1975.

Japan Petroleum found oil in four of eight wells drilled in 1974. Deminex continued exploratory drilling and made one discovery in 1974. Mobil made a wildcat discovery near Warri that tested at 2,000 barrels per day. Additional drilling was planned to evaluate the commercial potential. Occidental Petroleum resumed exploratory drilling after terminating an exploration agreement with Deminex. However, by December, Occidental suspended all drilling operations to review geologic and economic conditions.

**Table 4.—Nigeria: Production of crude petroleum and natural gas in December 1974**

| Company | Number of producing fields | Number of producing wells | Crude petroleum production | | Natural gas production | | Gas-oil ratio |
|---|---|---|---|---|---|---|---|
| | | | Total (barrels per day) | Percent | Total (thousand cubic feet per day) | Percent | (thousand cubic feet per barrel) |
| The Shell-BP Petroleum Development Co. of Nigeria Ltd | 73 | 696 | 1,338,025 | 64.9 | 1,380,454 | 63.7 | 1.032 |
| Mobil Exploration Nigeria Ltd | 9 | 81 | 245,353 | 11.9 | 184,567 | 8.5 | .752 |
| Gulf Oil Co. (Nigeria) Ltd | 5 | 130 | 229,276 | 11.1 | 206,121 | 9.5 | .899 |
| Nigerian AGIP Oil Company Ltd.–Phillips Petroleum Co | 6 | 94 | 166,227 | 8.1 | 358,462 | 16.6 | 2.156 |
| Elf–Nigeria Ltd | 6 | 72 | 83,176 | 4.0 | 36,568 | 1.7 | .440 |
| Total | 99 | 1,073 | 2,062,057 | 100.0 | 2,166,172 | 100.0 | [1]1.050 |

[1] Ratio represents the quotient of total natural gas production divided by total crude petroleum production and therefore is not cumulative from the detail reported.

Source: Department of Petroleum Resources, Federal Ministry of Mines and Power, (Lagos). Monthly Petroleum Information. December 1974.

# The Mineral Industry of Norway

By F. L. Klinger [1]

The Norwegian mineral industry continued to grow in 1974 despite rapidly rising wages and prices. Production of some major commodities, such as ilmenite, aluminum, ferroalloys, and crude oil, increased substantially; output of other commodities was not significantly different from 1973. A marked decrease in output of pyrite resulted from emphasis on recovery of copper and zinc at Løkken. New plants were completed, planned, or under construction for iron ore, aluminum, titanium pigment, magnesium chloride, olivine, cement, coal, petroleum products, and other materials.

The level of investment was relatively high in the mining and manufacturing sectors, but it was small compared with investments in offshore oil and gas production and transportation facilities. A dramatic increase in output of oil and gas was expected in 1975 and this, along with discovery of another large oil- and gasfield in 1974, may be the most far-reaching and promising development of the Norwegian mineral industry during the 1970's.

## PRODUCTION

Indices of production for the full year of 1974 were not available. The following tabulation shows preliminary indices for the first 10 months, (January to October) of each year for various sectors of the mineral industry:

| Industry sector | (1970=100) | |
|---|---|---|
| | 1973 | 1974 |
| Mining and quarrying: | | |
| Coal mines | 92 | 91 |
| Metal mines | 111 | 105 |
| Other mining and quarrying | 108 | 109 |
| All mining and quarrying [1] | 134 | 128 |
| Manufacturing: | | |
| Iron, steel, ferroalloys | 108 | 120 |
| Nonferrous metals | 118 | 125 |
| Ceramics, glass, glassware | 107 | 117 |
| Chemical raw materials | 115 | 118 |
| Refining of petroleum and coal | 116 | 111 |
| Electric power | 122 | 129 |

[1] Includes production of crude oil and natural gas.

Source: Statistisk Sentralbyrå (Oslo). Statistisk Månedshefte (Monthly Bulletin of Statistics). V. 92, No. 12, December 1974, pp. 18–20.

The overall decline in output of the mining and quarrying industry appeared to be generated by reduced output of pyrite, although production of iron and copper ores was also less than in 1973. Output of ilmenite ore and crude oil were substantially greater than in 1973.

Indices for the manufacturing industry showed strong gains in production of primary metals and nonmetallic commodities. The principal increases were registered in ferroalloys and aluminum; however, output of pig iron, steel, and slab zinc were less than in 1973. Production of nitrogen increased, but output of cement declined.

Production of mineral commodities is shown in table 1.

[1] Physical scientist, Division of Ferrous Metals.

## Table 1.—Norway: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **METALS** | | | |
| Aluminum metal: | | | |
| Primary ingot | r 557,359 | 620,365 | 649,333 |
| Secondary ingot | 11,965 | r e 12,000 | e 12,000 |
| Superpure | 3,500 | 3,500 | 4,700 |
| Cadmium, smelter | 87 | 88 | 90 |
| Cobalt, metal | 320 | 912 | 1,238 |
| Copper: | | | |
| Mine output, metal content: | | | |
| In copper concentrate | r 18,050 | 21,200 | 18,992 |
| In cupriferous pyrite | r 7,957 | 7,213 | 4,050 |
| Total | r 26,007 | 28,413 | 23,042 |
| Metal: | | | |
| Primary: | | | |
| Blister | r32,966 | 33,285 | 31,365 |
| Refined | r 26,452 | 25,806 | 24,887 |
| Secondary | r5,057 | r e 5,100 | e 5,100 |
| Iron and steel: | | | |
| Iron ore and concentrate thousand tons | r 3,881 | 3,970 | 3,918 |
| Roasted pyrite do | 159 | r e 160 | e 160 |
| Pig iron do | r 658 | 700 | 661 |
| Ferroalloys: | | | |
| Ferrochrome do | r 29 | 29 | 30 |
| Ferromanganese do | r 227 | 232 | 346 |
| Ferrosilicon (75% basis) do | r 240 | 279 | 301 |
| Ferrosilicomanganese do | r 155 | 169 | 198 |
| Other do | r 12 | 11 | 7 |
| Total do | r 663 | 720 | 882 |
| Steel, crude do | r 918 | 963 | 945 |
| Semimanufactures: | | | |
| Rolled do | 647 | 706 | e 662 |
| Finished castings do | 17 | 15 | e 19 |
| Lead mine output, metal content | r 3,429 | 3,631 | 3,501 |
| Magnesium metal, primary | r 36,423 | 37,521 | 38,247 |
| Molybdenum mine output, metal content | r 255 | 105 | -- |
| Nickel: | | | |
| Concentrate, metal content | r 377 | 465 | 576 |
| Metal, primary | r 43,349 | 42,706 | 43,223 |
| Platinum-group metals (exports) troy ounces | r 44,947 | 38,742 | 30,736 |
| Silicon, elemental (exports) | 44,984 | 55,742 | 63,931 |
| Titanium: | | | |
| Ilmenite concentrate | 608,477 | 752,934 | 847,720 |
| Dioxide e | 17,000 | 18,000 | 18,000 |
| Vanadium mine output, metal content e | 960 | 730 | 770 |
| Zinc: | | | |
| Mine output, metal content | r 14,613 | 19,812 | 21,903 |
| Metal, primary | r 73,348 | 80,505 | 71,919 |
| **NONMETALS** | | | |
| Cement thousand tons | r 2,729 | 2,709 | 2,660 |
| Feldspar, lump | 221,696 | r e 225,000 | e 225,000 |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous: | | | |
| Elemental nitrogen (total) thousand tons | 585 | 627 | 635 |
| Ammonia do | 609 | NA | NA |
| Fertilizer, gross weight do | 873 | NA | NA |
| Compound and other do | 947 | NA | NA |
| Graphite | r 8,538 | 6,676 | 9,515 |
| Lime (quicklime and hydrated lime) | r98,003 | 93,500 | 76,000 |
| Mica (exports) | r 4,126 | 4,445 | 4,203 |
| Olivine sand | r 147,866 | 147,643 | 149,462 |
| Pyrite and pyrrhotite: | | | |
| Gross weight | r 803,757 | 788,335 | 664,468 |
| Sulfur content | r 368,813 | 361,737 | 304,899 |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 73,326 | 74,714 | e 75,000 |
| Sodium carbonate | 20,000 | e 25,000 | e 25,000 |
| Stone: | | | |
| Dimension stone: | | | |
| Syenite (labrador) | 64,891 | NA | NA |
| Slate | 112,036 | NA | NA |
| Crushed and broken stone: | | | |
| Dolomite: | | | |
| Ground | 113,798 | 101,924 | NA |
| Not further described | 401,914 | 465,587 | NA |
| Limestone thousand tons | r 5,458 | r e 5,500 | NA |

See footnotes at end of table.

**Table 1.—Norway: Production of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone—Continued | | | |
| Crushed and broken stone—Continued | | | |
| Nepheline syenite | 161,064 | 200,313 | 203,571 |
| Quartz and quartzite | r507,388 | e 510,000 | NA |
| Other thousand tons | 1 1,365 | NA | NA |
| Sulfur, sulfuric acid (100%) | r 355,274 | 382,806 | 388,900 |
| Talc, soapstone, and steatite: | | | |
| Unground | 66,564 | NA | NA |
| Other | 77,985 | NA | NA |
| Total | 144,549 | 136,437 | e 140,000 |
| Other nonmetals, n.e.s., oxides and hydroxides of magnesium, strontium and barium | 23,968 | NA | NA |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal, all grades thousand tons | r 473 | 415 | 436 |
| Coke, all grades do | r 306 | 320 | 320 |
| Gas, manufactured million cubic feet | 1,021 | 1,003 | NA |
| Peat: | | | |
| For agricultural use | 11,965 | e 12,000 | e12,500 |
| For fuel use e | 5,000 | 5,000 | 5,000 |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 12,126 | 11,166 | 12,707 |
| Refinery products: | | | |
| Gasoline, motor do | 5,602 | 6,069 | 6,001 |
| Jet fuel do | 1,568 | 1,616 | 1,392 |
| Kerosine do | 1,225 | 1,372 | 829 |
| Distillate fuel oil do | 14,152 | 14,532 | 16,114 |
| Residual fuel oil do | 16,257 | 17,036 | 15,058 |
| Lubricants do | 273 | 266 | 98 |
| Other do | 3,481 | 3,293 | 4,173 |
| Refinery fuel and losses do | 2,638 | 3,089 | 2,237 |
| Total do | 45,196 | 47,273 | 45,902 |

e Estimate. p Preliminary. r Revised. NA Not available.
1 Excludes a quantity of stone only reported volumetrically as: 1972—4,779,891 cubic meters, 1973—NA, and 1974—NA.

## TRADE

Norway's exports of mineral commodities in 1974 were valued at about $2.17 billion.[2] Imports of mineral commodities were valued at $2.6 billion. The apparent deficit of approximately $430 million was several times larger than in 1973 and appeared to be principally due to the higher cost of crude oil and petroleum products in 1974. However, increasing Norwegian production of crude oil was expected to generate a surplus in mineral commodity trade in 1975.

Nonferrous metals (principally aluminum and nickel), ferroalloys, rolled steel, and liquid fuels were the major export items in 1974 and accounted for 75% of the total value of all mineral commodity exports. Imports of liquid fuels, iron and steel, basic chemicals (mainly aluminum oxide and hydroxide), and metallic ores (mainly nickel-copper matte) accounted for 83% of the value of mineral commodity imports in 1974.

Trade in mineral commodities in 1972 and 1973 is detailed in tables 2 and 3.

2 Values in Norwegian kroner (NKr) were converted to U.S. dollars at the rate of NKr5.542=US$1.00 for 1974 and NKr5.76=$1.00 for 1973. Source of 1974 conversion rate was International Monetary Fund; the rate for 1973 was derived from exchange rates published in Statistisk Månedshefte, v. 92, No. 2, 1974, p. 72.

## Table 2.—Norway: Exports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Alumina | 11 | 100 | Mainly to United Kingdom. |
| Metal, including alloys: | | | |
| Scrap | 6,645 | 8,941 | West Germany 5,528; Sweden 1,582; Netherlands 780. |
| Unwrought | 536,840 | 576,131 | West Germany 153,115; United Kingdom 135,389; Netherlands 46,658; Belgium-Luxembourg 41,183. |
| Semimanufactures | 46,326 | 54,937 | United Kingdom 15,770; Sweden 11,362; Denmark 8,245; Finland 3,849. |
| Antimony | 2 | 1 | NA. |
| Arsenic | -- | (1) | NA. |
| Cadmium | 78 | 80 | NA. |
| Chromium oxide and hydroxide | 3 | 1 | NA. |
| Cobalt | 492 | 723 | NA. |
| Copper: | | | |
| Ore and concentrate | 39,754 | 63,841 | West Germany 31,384; Sweden 25,161; Spain 6,446; Belgium-Luxembourg 850. |
| Oxide and hydroxide | 2,190 | 2,166 | Formosa 12; Denmark 7; Netherlands 5; United Kingdom 5. |
| Copper sulfate | 20 | -- | |
| Metal, including alloys: | | | |
| Scrap | 1,027 | 1,076 | West Germany 723; Belgium-Luxembourg 254; Sweden 67. |
| Unwrought: | | | |
| Unrefined | 7,325 | 7,633 | All to West Germany. |
| Refined | 26,166 | 26,796 | West Germany 11,272; United Kingdom 5,530; France 3,320; Sweden 3,107. |
| Semimanufactures | r 2,950 | 3,186 | Sweden 1,587; Denmark 668; United Kingdom 414; Germany 383. |
| Gold metal, unworked or partly worked troy ounces | 3,247 | 3,569 | Denmark 1,511; West Germany 1,029; Denmark 450; United Kingdom 386. |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite thousand tons | 2,919 | 2,988 | West Germany 1,532; United Kingdom 819; Poland 278; Finland 247. |
| Roasted pyrite | 164,658 | 174,524 | West Germany 149,659; Denmark 11,240; Sweden 11,218. |
| Metal: | | | |
| Scrap | 15,518 | 24,538 | West Germany 17,098; Sweden 4,350; Spain 3,025. |
| Pig iron, including cast iron | 103,960 | 140,167 | United Kingdom 53,122; West Germany 22,467; Sweden 11,665; France 9,465. |
| Ferroalloys: | | | |
| Ferromanganese | 210,284 | 225,254 | United Kingdom 45,875; Sweden 31,845; Belgium-Luxembourg 27,926; West Germany 27,175. |
| Other | 392,675 | 472,169 | West Germany 118,482; United Kingdom 106,945; Belgium-Luxembourg 41,254; Sweden 39,549. |
| Steel, primary forms | r 185,646 | 231,248 | Netherlands 121,678; Denmark 49,778; West Germany 28,967; United Kingdom 25,942. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 225,680 | 244,030 | United Kingdom 62,637; Sweden 49,249; West Germany 28,774; Denmark 28,205. |
| Universals, plates, sheets | 101,932 | 102,061 | Sweden 49,210; United Kingdom 21,975; Denmark 16,017; Finland 5,351. |
| Hoop and strip | 1,447 | 3,563 | Sweden 2,102; Denmark 479; Argentina 374; Finland 262. |
| Rails and accessories | 35 | 1,259 | Sweden 1,204; West Germany 50. |
| Wire | 9,245 | 10,947 | United Kingdom 2,125; Iraq 1,586; Iran 904; Greece 767; Portugal 710. |
| Tubes, pipes, fittings | 30,491 | 36,599 | Sweden 18,322; Denmark 9,048; Finland 2,702; United Kingdom 1,408. |

See footnotes at end of table.

## Table 2.—Norway: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Metal—Continued | | | |
| Semimanufactures—Continued | | | |
| Castings and forgings, rough | 12,039 | 12,763 | Sweden 8,700; Denmark 2,236; Liberia 1,407. |
| Total | 380,869 | 411,222 | |
| Lead: | | | |
| Ore and concentrate | 6,015 | 6,533 | West Germany 4,168; Netherlands 1,433; Belgium-Luxembourg 931. |
| Oxides | 28 | 12 | NA. |
| Metal, including alloys: | | | |
| Scrap | 5,501 | 4,554 | Denmark 2,838; Sweden 1,513; West Germany 203 |
| Unwrought | 663 | 520 | Denmark 213; Sweden 163; West Germany 75; United Kingdom 35. |
| Semimanufactures | 112 | 212 | Sweden 190; Canada 13. |
| Magnesium metal, including alloys: | | | |
| Unwrought -- value, thousands | $26,792 | $31,502 | NA. |
| Wrought | 165 | 196 | Netherlands 141; Sweden 51. |
| Manganese ore and concentrate | 657 | 3,030 | Sweden 1,850; United Kingdom 1,180. |
| Mercury 76-pound flasks | 1,886 | 464 | Netherlands 406; Denmark 58. |
| Molybdenum: | | | |
| Ore and concentrate | 584 | 218 | NA. |
| Metal, including alloys, all forms | (1) | (1) | |
| Nickel: | | | |
| Ore and concentrate | 7,946 | 11,535 | All to Finland. |
| Matte, speiss, similar materials | -- | 2 | NA. |
| Metal, including alloys: | | | |
| Scrap | 297 | 240 | West Germany 165; United Kingdom 36; Sweden 32. |
| Unwrought | 40,218 | 43,254 | United States 10,071; Canada 9,782; West Germany 6,365; Sweden 3,449. |
| Semimanufactures | 46 | 1 | NA. |
| Platinum-group metals and silver: | | | |
| Waste and sweepings kilograms | r 38,024 | 52,421 | West Germany 45,773; United Kingdom 5,278; Sweden 1,115. |
| Metal, including alloys: | | | |
| Platinum-group metals troy ounces | r 44,947 | 38,742 | United States 19,065; United Kingdom 6,880; Netherlands 4,823. |
| Silver do | 345,459 | 668,188 | Sweden 485,733; Denmark 152,748; Finland 22,345. |
| Rare-earth metals: | | | |
| Oxides | 3 | 4 | United States 3; Japan 1. |
| Metals, including alloys, all forms value | $752 | $172 | NA. |
| Silicon, elemental | 44,984 | 55,742 | West Germany 13,604; United Kingdom 11,739; U.S.S.R. 11,131; United States 10,763. |
| Tin metal, including alloys: | | | |
| Scrap long tons | 28 | 38 | Denmark 15; West Germany 13; United Kingdom 11. |
| Unwrought do | r 181 | 219 | Sweden 167; Finland 37; United Kingdom 14. |
| Semimanufactures do | 2 | 7 | Finland 5; Sweden 1. |
| Titanium: | | | |
| Ore and concentrate (ilmenite) | 598,729 | 684,660 | NA. |
| Oxides | 1,226 | 1,226 | Sweden 804; Denmark 189; Finland 110; United Kingdom 55. |
| Tungsten metal, including alloys, all forms value | $1,203 | $1,548 | NA. |
| Uranium and thorium metal, including alloys, all forms do | $10,528 | $19,608 | Denmark $12,900; Sweden $6,708. |
| Zinc: | | | |
| Ore and concentrate | 13,392 | 14,888 | Poland 8,748; Netherlands 3,955; West Germany 2,185. |
| Oxide | 742 | 923 | Sweden 463; Denmark 224; United States 80; Portugal 66. |
| Metal, including alloys: | | | |
| Blue powder | 2,225 | 2,899 | NA. |
| Scrap | 18 | 133 | France 43; Belgium-Luxembourg 39; West Germany 20; Sweden 19. |

See footnotes at end of table.

## Table 2.—Norway: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Zinc—Continued | | | |
| Metal including alloys—Continued | | | |
| Unwrought | 58,455 | 67,387 | Sweden 31,054; United Kingdom 20,091; West Germany 9,437; Denmark 4,645. |
| Semimanufactures | 854 | 597 | Sweden 370; Denmark 136; West West Germany 72; United Kingdom 16. |
| Other: | | | |
| Ore and concentrates | 18 | -- | |
| Ash and residue containing nonferrous metals | 8,209 | 6,691 | West Germany 3,015; Netherlands 1,083; Sweden 921; United Kingdom 871. |
| Oxides, hydroxides, peroxides of metals, n.e.s. | r 1 | 21 | Sweden 10; Netherlands 4. |
| Metals, including alloys: | | | |
| Metalloids, n.e.s | 3 | 11 | All to Belgium-Luxembourg. |
| Pyrophoric alloys value, thousands | $3 | $2 | NA. |
| Base metals, including alloys, all forms n.e.s | r 30 | 33 | West Germany 5. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s., grinding and polishing wheels and stones | 1,028 | 1,079 | Poland 214; Sweden 182; Finland 146; Turkey 128; Iran 69. |
| Asbestos | 8 | 1 | NA. |
| Barite and witherite | 30 | 52 | All to Sweden. |
| Boric oxide and acid | -- | 11 | Mainly to Portugal. |
| Cement, hydraulic -- thousand tons | 1,064 | 1,042 | United States 668; Ghana 229; Liberia 108. |
| Chalk | 25 | 1 | NA. |
| Clays and clay products, including all refractory brick: | | | |
| Crude clays, n.e.s. | 83 | 261 | Mainly to Gabon. |
| Products: | | | |
| Refractory, including nonclay brick | 7,326 | 8,006 | West Germany 5,226; Sweden 630; Belgium-Luxembourg 440; Romania 398. |
| Nonrefractory value, thousands | r $720 | $843 | West Germany $601; France $136; Netherlands $20; Sweden $16. |
| Diamond, gem, not set or strung do | $1 | $5 | All to United Kingdom. |
| Diatomite and other infusorial earth | 27 | 14 | NA. |
| Feldspar and related materials | 241,393 | 286,835 | West Germany 81,261; United Kingdom 60,076; Netherlands 43,031; Belgium-Luxembourg 24,196; France 20,390. |
| Fertilizer materials: | | | |
| Manufactured: | | | |
| Nitrogenous | 819,904 | 853,893 | NA. |
| Phosphatic | 20 | 18 | NA. |
| Potassic | 4 | 11 | NA. |
| Other | 589,605 | 776,306 | NA. |
| Ammonia value, thousands | $9,781 | $11,291 | NA. |
| Graphite, natural | 8,667 | 8,038 | NA. |
| Gypsum and plasters | 8,411 | 14,026 | Ghana 10,978; Liberia 3,048. |
| Lime | 35 | 81 | NA. |
| Mica, crude, including splittings and waste | 4,126 | 4,445 | France 1,120; West Germany 850; Sweden 401; Netherlands 318. |
| Pigments, mineral, processed iron oxide | 36 | 35 | Thailand 16; Peru 7. |
| Precious and semiprecious stones, except diamond value, thousands | $7 | $3 | NA. |
| Pyrite (gross weight) | 572,035 | 486,198 | West Germany 395,440; Sweden 57,792; United Kingdom 32,966. |
| Salt | 3,347 | 3,538 | Sweden 1,358; Canada 956; Denmark 810; United Kingdom 297. |
| Sodium and potassium compounds, n.e.s value thousands | $244 | $137 | NA. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Marble and other calcareous | 4,086 | 3,331 | West Germany 1,629; Italy 797; Japan 413; Netherlands 273. |
| Slate | 48,274 | 50,658 | Netherlands 20,530; Denmark 10,716; Belgium-Luxembourg 7,462. |

See footnotes at end of table.

## Table 2.—Norway: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel—Continued | | | |
| Dimension stone—Continued | | | |
| Crude and partly worked—Continued | | | |
| Other | 73,675 | 87,899 | France 27,574; Italy 22,195; West Germany 12,060; Spain 6,410. |
| Worked, all types | 201 | 146 | Mainly to Sweden. |
| Dolomite | 82,674 | 92,547 | NA. |
| Gravel and crushed rock thousand tons | 1,069 | 1,049 | West Germany 740; United Kingdom 197; Denmark 46; Sweden 43. |
| Limestone, excluding dimension | 11,998 | 18,712 | Denmark 10,005; Sweden 6,850. |
| Quartz and quartzite | 5,112 | 5,031 | West Germany 1,501; Belgium-Luxembourg 1,130; Denmark 1,122; Poland 510. |
| Sand, excluding metal-bearing | 2,842 | 2,608 | Ivory Coast 380. |
| Sulfur: | | | |
| Elemental | -- | 85 | NA. |
| Sulfur dioxide | 1,698 | 675 | Sweden 542; Denmark 132. |
| Sulfuric acid -- value, thousands | $1,401 | $1,951 | NA. |
| Talc, steatite, soapstone, pyrophyllite | 71,764 | 69,129 | United Kingdom 16,151; West Germany 13,073; Sweden 11,676; Denmark 6,359; Netherlands 5,205. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 580 | 73 | NA. |
| Slag, dross and similar waste, not metal-bearing | 18,629 | 18,323 | East Germany 8,362; West Germany 5,702; Portugal 4,259. |
| Oxides and hydroxides of magnesium, strontium, barium | NA | NA | NA. |
| Building materials of asphalt, asbestos, and fiber cement, unfired nonmetals, n.e.s | 7,211 | 10,784 | Mainly to Denmark. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | r 22 | 121 | Sweden 77; United Kingdom 37. |
| Carbon black | 5 | 30 | NA. |
| Coal and coke, including briquets: | | | |
| Anthracite and bituminous | 88,500 | 80,317 | Mainly to West Germany. |
| Coke and semicoke | 90,404 | 51,436 | Mainly to Venezuela. |
| Peat, including peat briquets and litter | 1 | 1 | NA. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 12,585 | 11,398 | United Kingdom 6,181; West Germany 2,539; France 1,380; Belgium-Luxembourg 791; Netherlands 507. |
| Refinery products: | | | |
| Gasoline, including natural do | 2,642 | 3,153 | Sweden 2,387; United Kingdom 625; Netherlands 135. |
| Kerosine and jet fuel do | 989 | 922 | Mainly to Sweden. |
| Distillate fuel oil do | 2,653 | 2,675 | Sweden 2,145; Denmark 327; United Kingdom 169. |
| Residual fuel oil do | 9,753 | 9,018 | United Kingdom 3,266; Sweden 2,988; Finland 1,962. |
| Lubricants do | 176 | 141 | Netherlands 38; Denmark 37; Belgium-Luxembourg 25; France 13. |
| Mineral jelly and wax do | 1 | 1 | Mainly to Sweden. |
| Other: | | | |
| Liquefied petroleum gas do | 289 | 343 | United Kingdom 267; Sweden 28; Denmark 24; Portugal 17. |
| Nonlubricating oils, n.e.s do | 1 | 14 | Mainly to Sweden. |
| Bitumen and other residues do | (1) | 1 | Do. |
| Bituminous mixtures, n.e.s do | (1) | (1) | |
| Petroleum coke do | (1) | (1) | NA. |
| Pitch do | (1) | (1) | NA. |
| Total | 16,504 | 16,268 | |
| Mineral tars and other coal-, petroleum-, or gas-derived crude chemicals | 37,227 | 19,445 | Netherlands 12,427; United Kingdom 6,271. |

r Revised. NA Not available.
1 Less than ½ unit.

## Table 3.—Norway: Imports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite | -- | 3,151 | Greece 2,750; Guyana 401. |
| Alumina | r 1,034,718 | 1,256,426 | Jamaica 596,268; Surinam 267,755; Guinea 146,954; France 28,603. |
| Metals including alloys: | | | |
| Scrap | 400 | 1,226 | Portugal 594; Netherlands 373; Belgium-Luxembourg 200. |
| Unwrought | 35,586 | 32,427 | U.S.S.R. 14,149; Sweden 11,656; Poland 2,360; Czechoslovakia 1,343. |
| Semimanufactures | r 19,763 | 20,952 | Sweden 6,275; Finland 3,690; Belgium-Luxembourg 3,348; Yugoslavia 2,272. |
| Antimony metal including alloys | 44 | 88 | People's Republic of China 80; West Germany 5; Sweden 3. |
| Arsenic trioxide, pentoxide, acid | 118 | 107 | Sweden 93; United Kingdom 9. |
| Beryllium metal, including alloys, all forms | 11 | -- | |
| Chromium: | | | |
| Chromite | 52,697 | 87,150 | Turkey 44,241; U.S.S.R. 26,330; Cyprus 9,975; Greece 6,290. |
| Oxide and hydroxide | 170 | 209 | West Germany 134; France 35; U.S.S.R. 25; Poland 10. |
| Metal, including alloys, all forms | 3 | (1) | NA. |
| Cobalt: | | | |
| Oxide and hydroxide | 8 | 15 | Belgium-Luxembourg 13; United Kingdom 1. |
| Metal, including alloys, all forms | 7 | 9 | Mainly from Belgium-Luxembourg. |
| Copper: | | | |
| Oxide and hydroxide | 231 | 240 | Finland 200; West Germany 40. |
| Copper sulfate | 994 | -- | |
| Metal including alloys: | | | |
| Scrap | 70 | 5 | All from United States. |
| Unwrought | 795 | 969 | United Kingdom 538; U.S.S.R. 201; Sweden 132; Netherlands 50. |
| Semimanufactures | 24,891 | 27,614 | Sweden 12,538; United Kingdom 4,034; Belgium-Luxembourg 2,218. |
| Gold metal, worked or partly worked ---- troy ounces | 49,319 | 34,080 | United Kingdom 22,762; West Germany 8,906; United States 1,222. |
| Iron and steel: | | | |
| Ore and concentrate | 13,435 | 43,802 | Sweden 33,883; West Germany 9,919. |
| Scrap | 59,643 | 26,475 | Denmark 15,209; United Kingdom 5,020; Sweden 2,194. |
| Pig iron, ferroalloys, similar materials | 14,452 | 15,425 | West Germany 5,059; Sweden 3,684; United Kingdom 2,703; U.S.S.R. 2,016. |
| Steel, primary forms | 132,839 | 141,360 | Netherlands 98,018; Belgium-Luxembourg 15,587; West Germany 14,975; Sweden 7,428. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 281,580 | 333,092 | West Germany 91,050; France 47,564; Sweden 46,330; Belgium-Luxembourg 42,987. |
| Universals, plates, sheets | 601,844 | 682,132 | West Germany 143,172; Sweden 105,325; United Kingdom 82,774; Belgium-Luxembourg 55,761. |
| Hoop and strip | 39,385 | 42,995 | Belgium-Luxembourg 11,465; West Germany 10,650; France 7,249; Sweden 4,865. |
| Rails and accessories | 13,490 | 8,829 | Sweden 4,941; West Germany 1,306; United Kingdom 1,153. |
| Wire | 10,670 | 11,285 | Sweden 4,361; Belgium-Luxembourg 3,161; United Kingdom 1,557. |
| Tubes, pipes, fittings | 87,785 | 117,727 | West Germany 43,096; United Kingdom 21,197; Sweden 15,874; France 8,691. |
| Castings and forgings, rough | 1,247 | 1,302 | Sweden 295; United Kingdom 254; Denmark 241; Austria 210. |
| Total | 1,036,001 | 1,197,362 | |

See footnotes at end of table.

## Table 3.—Norway: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Lead: | | | |
| Oxides | 1,259 | 779 | United Kingdom 336; West Germany 267; Sweden 142. |
| Metal including alloys: | | | |
| Scrap | 380 | 258 | Denmark 233; Sweden 13; Belgium-Luxembourg 10. |
| Unwrought | 11,704 | 12,584 | United Kingdom 7,068; Sweden 2,913; Denmark 1,102. |
| Semimanufactures | 1,113 | 1,163 | Netherlands 397; Belgium-Luxembourg 257; France 149. |
| Magnesium metal, including alloys: | | | |
| Unwrought -- value, thousands | $112 | $1,094 | NA. |
| Wrought | 31 | 17 | United Kingdom 7; Sweden 1; United States 1. |
| Manganese: | | | |
| Ore and concentrate | 721,194 | 714,776 | Republic of South Africa 189,549; Brazil 171,354; Ghana 102,906; Gabon 98,361. |
| Oxides | 427 | 764 | Netherlands 402; People's Republic of China 100; Belgium-Luxembourg 86. |
| Metal including alloys, all forms | 861 | 693 | Republic of South Africa 573; Netherlands 45; Iceland 20. |
| Mercury 76-pound flasks | 87 | 174 | Mainly from Sweden. |
| Molybdenum metal, including alloys, all forms | 3 | 11 | Mainly from Netherlands. |
| Nickel: | | | |
| Matte, speiss, similar materials | 85,492 | 89,646 | Canada 85,850; Republic of South Africa 3,748. |
| Metal including alloys: | | | |
| Scrap | -- | 15 | West Germany 7; United Kingdom 6; Netherlands 2. |
| Unwrought | 99 | 55 | United Kingdom 43; Canada 11. |
| Semimanufactures | 294 | 340 | West Germany 140; United Kingdom 115; Sweden 39. |
| Platinum-group metals and silver: | | | |
| Waste and sweepings kilograms | 4,155 | 8,965 | Sweden 6,761; Denmark 1,541; Finland 395; Singapore 208. |
| Metal including alloys: | | | |
| Platinum group troy ounces | r 3,119 | 8,488 | United Kingdom 6,205; West Germany 1,157; Switzerland 579. |
| Silver thousand troy ounces | 3,418 | 3,556 | United Kingdom 1,917; West Germany 1,453; Switzerland 131. |
| Silicon elemental value | $15,341 | $30,960 | All from West Germany. |
| Tantalum metal including alloys, all forms do | $1,654 | $688 | NA. |
| Tin: | | | |
| Oxide long tons | 2 | 2 | Mainly from Netherlands. |
| Metal including alloys: | | | |
| Scrap do | 26 | 39 | All from Sweden. |
| Unwrought do | 578 | 599 | United Kingdom 389; Netherlands 105; Denmark 80. |
| Semimanufactures do | 624 | 493 | United Kingdom 360; West Germany 85; Netherlands 28. |
| Titanium: | | | |
| Ore and concentrate | 297 | 245 | All from Australia. |
| Oxide | 1,522 | 1,605 | West Germany 1,079; United Kingdom 300; Spain 143. |
| Tungsten metal, including alloys, all forms | r 5 | 1 | Mainly from United Kingdom. |
| Uranium and thorium: | | | |
| Oxides including rare-earth oxides | 82 | 108 | United States 45; Finland 30; United Kingdom 15. |
| Metals including alloys, all forms value, thousands | (1) | (1) | NA. |
| Zinc: | | | |
| Ore and concentrate | 120,381 | 121,120 | Sweden 75,602; Australia 27,130; United Kingdom 5,369. |
| Oxide and peroxide | 1,550 | 2,336 | East Germany 865; West Germany 556; U.S.S.R. 359; Sweden 275. |
| Metal including alloys: | | | |
| Scrap | 2,753 | 2,818 | Sweden 2,413; Denmark 259; Finland 146. |
| Blue powder | 1,352 | 2,281 | France 2,235; United Kingdom 20; Netherlands 17. |

See footnotes at end of table.

## Table 3.—Norway: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Zinc—Continued | | | |
| Metal including alloys—Continued | | | |
| Unwrought | 751 | 759 | Poland 715; Denmark 21; Sweden 17. |
| Semimanufactures | 1,258 | 2,095 | France 987; West Germany 331; United Kingdom 261; Poland 231. |
| Other: | | | |
| Ore and concentrate | 288 | 724 | Australia 646; Greece 36; Sweden 20. |
| Ash and residue containing nonferrous metals | 43 | 985 | Belgium-Luxembourg 781; Sweden 163; Finland 16. |
| Oxides, hydroxides, peroxides of metals, n.e.s | r 207 | 257 | United Kingdom 132; People's Republic of China 40; Sweden 33; Netherlands 25. |
| Metals including alloys, all forms: | | | |
| Metalloids | 19 | 15 | Sweden 10; United Kingdom 5. |
| Alkali, alkaline earth, rare-earth metals | 107 | 67 | All from United Kingdom. |
| Pyrophoric alloys | 8 | 3 | United Kingdom 2; Australia 1. |
| Base metals, including alloys, all forms, n.e.s | r 61 | 43 | Sweden 14; United Kingdom 10; United States 5. |
| NONMETALS | | | |
| Abrasives: | | | |
| Pumice, emery, natural corundum | 6,350 | 5,227 | Iceland 4,903; West Germany 111; Netherlands 93; United States 53. |
| Dust and powder of natural or synthetic precious or semiprecious stones, except diamond kilograms | 2 | 31 | Mainly to United Kingdom. |
| Grinding and polishing wheels and stones | 715 | 972 | Austria 223; Poland 186; Sweden 186; Portugal 175. |
| Asbestos | 5,114 | 4,748 | Canada 2,767; U.S.S.R. 1,452; United States 273; Finland 147. |
| Barite and witherite | 27,673 | 33,525 | Netherlands 14,995; Morocco 7,919; Iceland 7,292; Italy 1,292. |
| Boron materials: | | | |
| Crude natural borates | 3,485 | 3,377 | United States 2,725; Netherlands 650. |
| Oxide and acid | 338 | 380 | France 209; West Germany 107; United States 52. |
| Cement, hydraulic | 12,588 | 11,245 | Sweden 3,662; Denmark 1,765; Netherlands 1,729; United Kingdom 1,366. |
| Chalk | 8,833 | 8,811 | Denmark 3,553; France 2,323; Sweden 2,221; Switzerland 399. |
| Clays and clay products: | | | |
| Crude clays: | | | |
| Fuller's earth, dinas, chamote | 640 | 784 | United Kingdom 468; United States 221; West Germany 79. |
| Kaolin | 73,946 | 85,406 | United Kingdom 82,760; Sweden 1,010; United States 586. |
| Other | 43,253 | 41,420 | United Kingdom 25,622; Sweden 3,317; Czechoslovakia 2,735; West Germany 2,534; Poland 2,414. |
| Products: | | | |
| Refractory | 21,461 | 25,402 | Sweden 8,650; Austria 3,951; West Germany 3,886; United Kingdom 3,303. |
| Nonrefractory value | r $4,112 | $5,306 | West Germany $1,566; Sweden $1,037; Netherlands $903; Japan $713; Denmark $570. |
| Cryolite and chiolite | 2,304 | 4,762 | All from Denmark. |
| Diamond: | | | |
| Gem, not set or strung thousand carats | 10 | 5 | Mainly from Belgium-Luxembourg. |
| Industrial value | $13,536 | $1,032 | NA. |
| Diatomite and other infusorial earth | 1,197 | 1,259 | Iceland 510; United States 405; Denmark 116; Sweden 98. |

See footnotes at end of table.

## Table 3.—Norway: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Feldspar | 6 | 66 | Mainly from West Germany. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Phosphatic | 370,517 | 403,925 | U.S.S.R. 283,190; United States 65,521; Morocco 39,079; Spain 11,300. |
| Manufactured: | | | |
| Nitrogenous | r 2,453 | 1,948 | West Germany 1,437; Poland 427; Belgium-Luxembourg 72. |
| Phosphatic | 14,559 | 15,110 | Mainly from Sweden. |
| Potassic | 235,223 | 247,937 | France 88,590; West Germany 63,129; Spain 58,452; Israel 18,840. |
| Other | 4,413 | 12,230 | Mainly from Sweden. |
| Ammonia | 4,593 | 29,149 | United Kingdom 20,023; Netherlands 5,210; France 2,605. |
| Fluorspar | 34,071 | 32,960 | United Kingdom 20,788; Spain 7,889; Italy 3,403; West Germany 679. |
| Graphite, natural | 328 | 181 | United Kingdom 119; West Germany 41. |
| Gypsum and plasters | 237,156 | 248,135 | Poland 120,633; France 110,540; Morocco 7,250; Spain 5,770. |
| Lime | 16,864 | 17,923 | Mainly from Denmark. |
| Magnesite | 4,058 | 4,290 | North Korea 1,941; Austria 1,113; People's Republic of China 705. |
| Mica, worked and unworked, all forms | r 5,854 | 3,295 | India 2,258; Brazil 600; Republic of South Africa 317. |
| Pigments, mineral: | | | |
| Natural, crude | 211 | 177 | West Germany 60; Belgium-Luxembourg 14. |
| Iron oxide, processed | 2,543 | 2,899 | West Germany 2,512; Netherlands 108; United Kingdom 86. |
| Precious and semiprecious stones, except diamond, including synthetic stones kilograms | 6,130 | 398 | West Germany 277; Switzerland 34; France 29; Japan 17. |
| Salt and brine | 331,534 | 311,993 | Netherlands 123,459; Tunisia 71,012; United Kingdom 37,390; West Germany 32,675; East Germany 32,201. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | r 42,818 | 49,073 | Belgium-Luxembourg 30,914; Netherlands 15,860; France 1,375. |
| Caustic potash, sodic and potassic peroxides | 726 | 801 | Sweden 405; West Germany 211; France 128. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous | 685 | 248 | People's Republic of China 41; Sweden 20. |
| Slate | 2,705 | 3,734 | Sweden 3,570; East Germany 164. |
| Other | 2,349 | 8,089 | Sweden 6,291; Portugal 929; Iceland 600. |
| Worked, all types | 1,617 | 4,489 | Portugal 2,619; Sweden 1,440; People's Republic of China 215. |
| Dolomite | 2,911 | 2,878 | West Germany 1,113; Sweden 1,107; United Kingdom 596. |
| Flint | 1,285 | 592 | Denmark 442; France 120; United States 26. |
| Gravel and crushed rock | 64,264 | 55,357 | Mainly from Sweden. |
| Limestone | 230,551 | 255,393 | Mainly from United Kingdom. |
| Quartz and quartzite | 193,326 | 243,971 | Spain 123,071; Portugal 71,509; Sweden 48,616. |
| Sand, excluding metal-bearing | 159,064 | 185,530 | Belgium-Luxembourg 95,288; Sweden 46,430; United Kingdom 18,549; Denmark 15,973. |
| Sulfur: | | | |
| Elemental | 17,535 | 20,735 | Poland 16,053; France 4,165; Belgium-Luxembourg 237. |
| Sulfur dioxide | 3,745 | 8,817 | All from Sweden. |
| Sulfuric acid | 34,276 | 37,109 | Poland 24,243; West Germany 6,420; Sweden 6,384. |
| Talc, steatite, soapstone, pyrophyllite | 3,029 | 5,063 | India 3,477; Pakistan 500; United States 243; Canada 225; People's Republic of China 220. |

See footnotes at end of table.

## Table 3.—Norway: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Other, n.e.s.: | | | |
| Crude | 63,472 | 67,009 | West Germany 58,170; East Germany 4,660; Sweden 3,308. |
| Slag, dross and similar waste, not metal-bearing | 48,815 | 58,568 | Sweden 49,097; Denmark 4,714; Belgium-Luxembourg 2,140; France 1,950. |
| Oxides and hydroxides of magnesium, strontium, barium | 264 | 1,409 | United Kingdom 1,058; East Germany 200; France 90. |
| Building materials of asphalt, asbestos and fiber cement, unfired nonmetals, n.e.s | 9,777 | 8,819 | Denmark 2,602; United Kingdom 1,470; Belgium-Luxembourg 1,372; Netherlands 1,107; West Germany 828. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 371 | 414 | Mainly from United States. |
| Carbon black | 4,508 | 4,893 | Sweden 2,150; West Germany 1,354; United Kingdom 693. |
| Coal, all grades, including briquets thousand tons | r 424 | 415 | Poland 169; United States 97; United Kingdom 83; Republic of South Africa 18; France 18. |
| Coke, all types do | 516 | 577 | United Kingdom 368; West Germany 103; France 46. |
| Peat including peat briquets and litter | 3,539 | 4,880 | Mainly from Sweden. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | r 47,235 | 52,136 | Iran 31,977; Muscat and Oman 7,831; Saudi Arabia 3,781; Algeria 2,498; Trucial States 2,391. |
| Refinery products: | | | |
| Gasoline including natural do | 6,327 | 7,684 | United Kingdom 1,848; U.S.S.R. 1,558; Belgium-Luxembourg 1,418; Netherlands 1,168. |
| Kerosine and jet fuel do | 4,029 | 3,364 | United Kingdom 2,037; Belgium-Luxembourg 707; Netherlands 249; Trinidad and Tobago 231. |
| Distillate fuel oil do | 10,787 | 12,690 | United Kingdom 4,535; Netherlands 2,690; Belgium-Luxembourg 2,439; Trinidad and Tobago 980. |
| Residual fuel oil do | 6,666 | 5,201 | Netherlands 1,959; U.S.S.R. 891; Denmark 583; United Kingdom 461; Belgium-Luxembourg 362. |
| Lubricants do | 441 | 471 | United Kingdom 156; Sweden 130; Denmark 95; Belgium-Luxembourg 37; Netherlands 25. |
| Mineral jelly and wax do | 47 | 65 | West Germany 45; U.S.S.R. 7; United Kingdom 4; Hungary 2. |
| Other: | | | |
| Liquefied petroleum gas do | 103 | 108 | Sweden 60; Denmark 25; Netherlands 18. |
| Nonlubricating oil n.e.s do | 172 | 110 | Netherlands 77; France 16; Sweden 6; Belgium Luxembourg 4. |
| Bitumen and other residues do | 1,068 | 1,125 | Denmark 462; Netherlands Antilles 402; Belgium-Luxembourg 83; West Germany 51. |
| Bituminous mixtures, n.e.s do | 17 | 14 | United Kingdom 5; Denmark 3; West Germany 2; Sweden 2. |
| Petroleum coke do | 1,488 | 1,784 | United States 1,447; United Kingdom 226; Netherlands 57. |
| Pitch and pitch coke do | 421 | 558 | United Kingdom 277; West Germany 247; Belgium-Luxembourg 32. |
| Total do | r 31,566 | 33,174 | |

See footnotes at end of table.

Table 3.—Norway: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Mineral tars and other coal-, petroleum-, or gas-derived crude chemicals | 20,600 | 19,527 | United Kingdom 13,612; Poland 2,292; Netherlands 1,331; Belgium-Luxembourg 874. |

r Revised. NA Not available.
1 Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Production of primary aluminum in 1974 was 4% more than in 1973. Output was equivalent to about 93% of Norway's annual production capacity. Production of semimanufactures (110,000 tons) increased 10% and was equivalent to about 70% of production capacity.[3]

Exports of unwrought aluminum and alloys in 1974 amounted to 555,000 tons valued at about $410 million. The average export value of ingot in 1974 was about 28% higher than in 1973. Exports of semimanufactures totaled 39,000 tons in 1974, about 28% less than in 1973.

Imports of raw materials in 1974 included 1,287,000 tons of aluminum oxide and hydroxide and 6,600 tons of bauxite. Imports of metal totaled 56,000 tons, which was about evenly divided between ingot and semimanufactures. Domestic consumption of primary aluminum was 122,700 tons in 1974 compared with 108,000 tons in 1973.

There was no new production capacity for primary aluminum installed in 1974. Total capacity at yearend was about 690,000 tons per year. The smelter at Eydehavn, which had an output capacity of 15,000 tons per year and was owned jointly by Alcan Aluminium Ltd. and British Aluminum Co. Ltd., was closed in 1974. This left eight primary smelters operating in Norway. Production capacity for superpure aluminium was increased 33%, to 4,700 tons per year, by Vigeland Metal Refinery A/S.

New extrusion plants were started up in 1974 by I/S Aluminiumprofiler, A/S Årdal og Sunndal Verk (ASV), and Norsk Hydro a.s. Karmøy Fabrikker (formerly Alnor Aluminum Norway A/S). The latter company increased production capacity for extrusion bolts at Karmøy 70% to 56,000 tons per year. Norsk Hydro A/S, the sole owner of Alnor since mid-1973, operated semifabricating plants in the United Kingdom and Austria, and opened new plants in France and Belgium in 1974. The company also applied to Norwegian authorities in 1974 for permission to build a new aluminum smelter on Karmøy. The proposed plant would have a production capacity of 80,000 tons per year.

Alcan Aluminium sold one-half of its 50% interest in ASV to the Norwegian Government for $62 million. This will increase government ownership of ASV to 75%, effective January 1, 1975. ASV is the largest Norwegian producer of primary aluminum, with a production capacity of about 300,000 tons per year.

In other developments, Norsk Hydro decided to participate in a project to mine bauxite in the Amazon Basin of Brazil. The project was expected to provide the company with about 350,000 tons of bauxite per year, by 1979. The Federation of Norwegian Industries awarded its 1974 prize for environmental control to the Mosjøen smelter, which is owned jointly by the Aluminum Company of America and Elkem-Spigerverket A/S.

**Copper and Zinc.**—Mine output and exports of copper concentrate in 1974 were 10% to 15% less than in 1973. The decline appeared to be related to a sharp drop in copper prices that occurred in 1974. Zinc prices were more stable, and output and exports of zinc concentrate increased. Copper and zinc are coproducts at most Norwegian base-metal mines. Preliminary data on output of copper and zinc concentrates in 1974, by mine, is shown in the accompanying tabulation, in metric tons:

[3] Aluminium (Duesseldorf). V. 51, No. 1, January 1975, p. 62.

| Company | Mine | Concentrates | |
|---|---|---|---|
| | | Copper | Zinc |
| A/S Sulitjelma Gruber | Sulitjelma | 19,129 | 1,127 |
| Grong Gruber A/S | Grong | 16,620 | 4,120 |
| Folldal Verk A/S | Tverrfjellet | 17,008 | 11,868 |
| Do | Repparfjord | 9,356 | -- |
| Orkla Industrier A/S | Løkken | 4,548 | 928 |
| A/S Røros Kobberverk | Lergruvbakken | 2,094 | 8,630 |
| A/S Bleikvassli Gruber | Bleikvassli | 1,100 | 8,200 |
| Bergverksselskapet Nord-Norge A/S | Mofjellet | 1,150 | 6,900 |
| A/S Bidjovagge Gruber | Bidjovagge | 4,640 | -- |
| Killingdal Grubeselskab | Killingdal | 1,746 | 1,935 |
| Total | | 77,391 | 43,526 |

A new flotation plant of Orkla Industrier A/S (formerly Orkla Grube-Aktiebolag) came onstream in October 1974. As a result, production of copper and zinc concentrates by the firm was expected to increase in 1975 to about 21,000 tons and 6,000 tons, respectively. Exports of copper in 1974 included 6,300 tons of blister produced by A/S Sulitjelma Gruber and 26,000 tons of refined copper produced by Falconbridge Nikkelverk A/S. Nearly 50% of the metal was shipped to West Germany. Exports of slab zinc totaled 45,000 tons, of which about 19,000 tons was shipped to Sweden.

**Iron Ore.**—Production and exports of iron ore in 1974 were slightly less than in 1973; however, average product quality increased when A/S Sydvaranger brought a second pelletizing line into production in May. The new pelletizing line has a production capacity of 1.5 million tons per year and raised the company's output capacity for pellets to 2.7 million tons per year. Production of pellets in 1974 included 1.9 million tons by Sydvaranger at Kirkenes and an estimated 500,000 tons by A/S Norsk Jernverk near Mo-i-Rana.

In the Rana mine area, stripping operations were begun in late 1974 at the Ortfjell ore body, about 5 miles east of the crushing station at Storforshei. Open pit production from the Ortfjell deposit was scheduled to begin in 1976, and will provide the bulk of Rana ore by 1980. Ore reserves at Ortfjell total about 150 million tons averaging 32% iron and 4% magnetic iron. Recovery of this quantity of ore will require stripping 380 million tons of waste rock. Ultimate pit dimensions indicated by the mining plan are about 2 miles in length, ½-mile in width, and up to 1,500 feet in depth. Concentrate production at the Rana mine in 1974 included 705,000 tons of sinter feed and 292,000 tons of pellet feed.

Owing to a subsidence problem which developed in 1973, production of vanadium-bearing magnetite concentrate at the Rødsand mine was only 98,000 tons in 1974, but planned output for 1975 (142,000 tons) indicated that a return to normal operations was expected. The mine is owned by Elkem-Spigerverket A/S.

Elsewhere, Fosdalens Bergverks A/S produced 472,000 tons of magnetite concentrate, and A/S Titania produced 46,000 tons of byproduct magnetite from ilmenite operations at Tellnes. About 12,000 tons of hematite ore were produced at the Bråstad mine of Elkem-Spigerverket A/S.

Exports in 1974 totaled 2,657,000 tons of iron ore valued at about $45 million and 152,000 tons of roasted pyrite valued at about $500,000.

**Iron and Steel.**—Production and exports of pig iron and steel in 1974 were less than in 1973, but consumption of steel appeared to increase about 25% to 2 million tons. The largest increases in apparent consumption occurred in plate, sheet, and tubular products. This was related to strong demand from the shipbuilding industry (including construction of offshore rigs) and for pipe to be used in offshore drilling operations and laying oil and gas pipelines in the North Sea.

Production and exports of ferroalloys increased substantially in 1974 because foreign demand was strong and prices were relatively high. Total output of ferroalloys was 882,000 tons. Exports totaled 837,000

tons with an aggregate value of about $300 million. Exports included 309,000 tons each of ferrosilicon and ferromanganese, 190,000 tons of ferrosilicomanganese, 27,400 tons of ferrochrome, and 658 tons of ferrovanadium. The principal destinations of ferroalloy exports were West Germany and the United Kingdom. Imports of manganese ore and chromite in 1974 totaled 1,033,000 tons and 86,000 tons, respectively.

**Magnesium.**—Deliveries of magnesium and magnesium alloys by Norsk Hydro totaled 43,000 tons in the year ended June 30, 1974. A price increase of about 15% compared with the previous financial year was reported by the company.[4] Exports of unwrought magnesium during calendar 1974 were valued at approximately $44 million.

Norsk Hydro was building a new plant at Herøya for the production of anhydrous magnesium chloride. The plant will use a new process developed by the company and is scheduled to begin production in early 1977. The plant will provide raw materials for production of 15,000 tons of primary magnesium per year. The company was also finalizing plans to produce premium-grade magnesia in northern Norway. The planned facilities would be completed near Sørfold in Nordland by late 1977 and would have a production capacity of 200,000 tons per year of magnesia.

**Nickel, Cobalt, and Platinum-Group Metals.**—A/S Titania continued to account for all mine production of nickel, which was contained in sulfide concentrates recovered from ilmenite ore at Tellnes. Output of concentrates was 13,000 tons in 1974, and exports totaled 13,515 tons valued at about $1.4 million.

Stavanger Staal A/S continued exploration for nickel in the Ballangen area south of Narvik. The company reportedly has outlined 40 million to 50 million tons of material containing an average of 0.35% Ni and very small quantities of copper. The exploration program was to be completed in 1975.

Imports of copper-nickel matte from Canada by Falconbridge Nikkelverk A/S totaled 93,243 tons in 1974, about 4% more than in 1973. Production and exports of refined nickel and cobalt from the refinery at Kristiansand were also increased. Exports in 1974 inclued 43,810 tons of nickel, 1,172 tons of cobalt, and 30,736 troy ounces of platinum-group metals, having an aggregate value of approximately $180 million. The principal destinations of nickel exports in 1974 were the United States (15,775 tons), West Germany (6,657 tons), Sweden (4,170 tons), the United Kingdom (4,130 tons), and the Netherlands (3,930 tons).

**Silicon.**—Production and exports of elemental silicon continued to increase. Exports in 1974 totaled about 64,000 tons valued at nearly $55 million, more than twice the value of silicon exports in 1973.

**Titanium.**—Production and exports of ilmenite concentrate continued to increase in 1974. A/S Titania, which accounts for more than 99% of Norwegian production of ilmenite, increased output 12% compared with that of 1973. Exports of concentrate in 1974 totaled 777,000 tons valued at about $12.5 million.

NL Industries, Inc., the parent company of A/S Titania, announced plans to increase production capacity for titanium pigment at Fredrikstad, Norway, and Nordenham, West Germany. Capacity of the Fredrikstad plant (operated by Kronos Titan A/S) will be increased 20% to 25,000 tons per year by early 1976. Capacity at Nordenham (Kronos Titan GmbH) will be increased 50% to 60,000 tons per year, also in 1976. Both plants are supplied by A/S Titania.

Exports of titanium dioxide and titanium white in 1974 were valued at $12 million.

## NONMETALS

**Cement and Other Construction Materials.**—The level of activity in the construction industry in 1974 appeared not very different from that of 1973. There was a slight increase in the number of building starts and the number of buildings under construction, but the number of completions was less. The index of wholesale prices for cement and brick-factory products for the first 11 months of 1974 was 23% higher than for the corresponding period of 1973.[5]

Production of cement was slightly less than in 1973, but exports declined 15% to 876,000 tons. Imports of cement from Norway by the United States in 1974

[4] Norsk Hydro A/S. Annual Report 1973–74, p. 19.

[5] Statistisk Sentralbyrå (Oslo). Statistisk Månedshefte (Monthly Bulletin of Statistics). V. 92, No. 12, December 1974, pp. 75–76.

totaled about 668,000 tons valued at $11.6 million; this was about the same tonnage imported by the United States in 1973, but the total value was 7.6% higher.

Exports of building stone in 1974 were valued at $19.1 million, nearly 19% more than in 1973. As usual, most of the stone consisted of gray syenite ("labrador") (92,500 tons) and slate (45,100 tons). During the last 13 years, most "labrador" has been shipped to France, Italy, and West Germany; most of the slate has been shipped to the Netherlands and Denmark.

Production of olivine in 1974 included 116,500 tons by K/S Norrdal Olivin A/S & Co. and 149,462 tons of olivine sand by A/S Olivin. The latter company was investing $6 million in new production facilities at Åheim, including a 100-meter tunnel kiln and four 38-meter sand silos. The company's output in 1974 (including 14,000 tons of refractory brick) was valued at $4 million; output planned in 1975 was 230,000 tons of olivine sand and 27,000 tons of refractory brick with a combined value of over $7 million.

Exports of other construction materials in 1974 included 1.2 million tons of gravel and crushed stone. Imports included 150,000 tons of clays and 242,000 tons of gypsum.

**Feldspar.**—Production and exports of feldspar continued to increase in 1974. Exports were valued at approximately $7.5 million, with nepheline syenite accounting for about 60% of the total. Output of nepheline syenite by Norsk Nefelin division of Elkem-Spigerverket A/S increased for the 14th consecutive year. The syenite is produced at Stjernøy in the Lofoten Islands.

**Fertilizer Materials.**—Norsk Hydro continued to account for the bulk of Norway's production and trade in crude and manufactured fertilizer materials. The company reported output of 710,000 tons of ammonia during the year ended June 30, 1974, along with sales of 660,000 tons of calcium nitrate, 220,000 tons of urea, and 1.2 million tons of complex fertilizers. These totals were slightly higher than those reported during 1973.

Norsk Hydro planned to expand its production capacity for fertilizer. Construction of a fertilizer plant was planned at Mongstad, where the company is building a petroleum refinery. The company was also studying the feasibility of constructing ammonia plants based on natural gas in southwestern Norway (Karmøy) and Scotland.

In addition to manufacturing ammonia in Norway, Norsk Hydro began production of ammonia and urea in Qatar in 1974. The company owned 20% of Qatar Fertilizer Co., and was operator and sales agent for the plant. The first shipment of ammonia was made in March. Production capacity of the plant was stated to be 900 tons of ammonia and 1,000 tons of urea per day.

Imports of fertilizer materials during 1974 included 418,000 tons of crude phosphate valued at $26 million, and 268,000 tons of potassium compounds valued at $18 million. Norsk Hydro reported that prices for fertilizer in Norway remained steady despite rising prices for raw materials. However, export prices appeared to increase substantially. Exports of manufactured fertilizer (including calcium nitrate) in 1974 totaled 1.6 million tons valued at about $153 million. The unit value of exports was more than 50% higher than in 1973.

**Pyrite and Sulfur.**—Production and exports of pyrite declined in 1974. This was mainly due to changes in production at Løkken. By late 1974, the mine was producing only copper and zinc concentrates for shipment; the pyrite concentrate was to be stored underwater until further notice. The last cargo of cupriferous pyrite was shipped from Thamshavn on May 25. Exports of pyrite (including cupriferous pyrite) from Norway in 1974 totaled 407,000 tons valued at about $6.4 million.

Production of pyrite at principal mines in 1973 and 1974 and planned production for 1975 is shown in the following tabulation, in metric tons:

| Mine | Production 1973 | Production 1974 | Planned production for 1975 |
|---|---|---|---|
| Tverrfjellet | 225,207 | 260,311 | 225,000 |
| Løkken [1] | 243,622 | 93,148 | -- |
| Skorovas | 159,120 | 152,570 | 141,000 |
| Sulitjelma | 82,078 | 58,903 | NA |
| Fosdalens | 24,958 | 24,238 | 25,200 |
| Bleikvassli | 17,900 | 19,300 | 21,000 |
| Mofjellet | 7,400 | 9,000 | 12,000 |
| Killingdal | 503 | 4,500 | 12,000 |
| Total | 760,788 | 621,970 | [2] 436,200 |

NA Not available.
[1] Cupriferous pyrite.
[2] Excluding Sulitjelma.

Source: Bergverks-Nytt (Trondheim). V. 22, No. 2, February 1975, pp. 10–13.

Norwegian production of sulfuric acid in 1974 was slightly more than in 1973. Most sulfuric acid is made at Sarpsborg by A/S Borregaard, parent company of the Tverrfjellet mine, and at Odda by Det Norske Zinkkompani A/S. Production of acid by the latter company in 1974 was 81,150 tons, a record high. A new plant for manufacturing sulfuric acid was under construction at Odda, with completion scheduled for mid-1975.

Exports of sulfuric acid in 1974 were valued at about $2.5 million; imports totaled 57,746 tons valued at about $2 million. Imports of elemental sulfur totaled 22,000 tons.

## MINERAL FUELS

**Coal and Coke.**—Production of coal from Svalbard (Spitzbergen) in 1974 changed little from that of 1973. Most of the coal continued to be shipped to the state-owned steelworks in northern Norway, where it was mixed with imported coal for the manufacture of coke. Only 49,600 tons of coal were exported in 1974; imports totaled 543,000 tons. Imports of metallurgical coke increased to 706,000 tons in 1974, and imports of petroleum coke rose to 342,000 tons.

Store Norske Spitsbergen Kullkompani A/S (SNSK), the only Norwegian producer of coal, continued to develop the Svea deposits on Van Mijnen-fjord, about 25 miles south of Longyearbyen. About $90 million is being spent to develop the Svea deposits, where coal seams are up to 5 meters thick, compared with a thickness of only about 0.7 meter at Longyearbyen. Mining at Sveabyen will be mechanized. Facilities being built there include a washing plant, accommodations for vessels up to 60,000 deadweight tons, and living quarters for 400 employees. Anticipated production is 800,000 tons per year beginning in 1978 or 1979, which can be increased to 1.2 million tons per year if market conditions permit. Coal reserves at Sveabyen were reported to be at least 20 million tons compared with about 8 million tons at Longyearbyen.

**Petroleum and Natural Gas.**—*Exploration.*—In August 1974, discovery of a major oil- and gasfield in the Norwegian sector of the North Sea was announced by the Statoil/Mobil Oil consortium.[6] Ownership in the consortium is Den Norske Stats Oljeselskap A/S (Statoil), 50%; Mobil Exploration Norway, 15%; Conoco Norway, 10%; Esso Exploration Norway, 10%; A/S Norske Shell, 10%; Saga Petroleum A/S & Co., 45/24ths; and Amoco Norway, Amerada Hess Norway, and Texas Eastern Norway, 25/24ths each. The field, named "Statfjord," lies about 95 miles west of the Sognefjord estuary, close to the British-Norwegian boundary. Recoverable reserves were initially estimated at 2 billion barrels of oil and 50 billion cubic meters of natural gas. The discovery was made in Jurassic (Dogger and Lias) sandstones at a depth of about 8,500 feet. Three wells had test yields of 10,000 barrels per day or more of low-sulfur, 37° to 41° API gravity oil.

Seven exploratory wells were drilled by the Phillips Group in the Ekofisk Area during 1974. Five wells were drilled by the Petronord Group, mostly in the Frigg-Heimdal Area. This exploration resulted

[6] The Petroleum Economist. V. 41, No. 10, October 1974, p. 367. World Petroleum Report '75. V. 21, p. 75.

in discovery of the Northeast Frigg Field. The Heimdal gasfield was declared commercial in April 1974; recoverable reserves of at least 40 billion cubic meters of gas were indicated. Esso Exploration also found gas north of the Frigg Field.

Late in the year, the Government awarded eight concession areas south of 62° latitude to various company groups operated by Amoco, Chevron, Conoco, Norsk Hydro, or Statoil. Areas north of 62° latitude continued to be reserved for the Government.

*Production.*—Development of the Ekofisk Field was continued by the Phillips Group. Thirteen development wells were completed, and major components of oil and gas processing equipment were installed on top of the million-barrel storage tank, which was set in place in 1973. By yearend, the first of two compressors was installed and reinjection of gas was proceeding.[7] Production capability for crude oil in the Ekofisk Field was increased to about 180,000 barrels per day during 1974, and expansion to 300,000 barrels per day was expected during 1975.

The 220-mile, 34-inch crude oil pipeline from Ekofisk to Teesside, England, was completed in 1974. The terminal to receive the oil was scheduled for completion by mid-1975. Another major development was completion of the 274-mile, 36-inch gas pipeline from Ekofisk to Emden, West Germany.

During 1974, the Phillips Group arranged for $116 million in additional financing for development of fields in the Ekofisk Area, and $314 million for oil and gas transportation systems. According to the Norwegian Government,[8] investments in development of oil- and gasfields in the Ekofisk Area were estimated to total $1,765 million as of February 1, 1974.

Total production of oil for sale from the Ekofisk, West Ekofisk, Tor, and Cod Fields was expected to reach 200 million barrels per year in 1978, after which output would decrease to about 35 million barrels per year in 1987. Production of natural gas for sale from these fields was forecast at about 12 billion cubic meters per year in 1978, declining to about 10 billion cubic meters per year by 1987.

Development of the Frigg gasfield, which straddles the boundary between the Norwegian and British sectors, was proceeding more slowly. In mid-1974, the Norwegian Parliament approved the sale of gas from the Norwegian part of the field to the British Gas Corporation, and a pipeline was being laid from the British part of the field to Scotland. Production of gas was expected to begin by mid-1976. Agreements between concessionholders on both sides of the boundary, concerning the proportion of gas reserves owned by each group, have not yet been negotiated. Recoverable gas reserves in the Frigg Field have been tentatively estimated at 200 billion cubic meters, and another 80 billion cubic meters may be recoverable from the East Frigg and Heimdal Fields nearby. The production license for the Norwegian sector is held by the Petronord Group, of which Norsk Hydro owns 32.87%.

Recoverable reserves in the Norwegian Continental Shelf south of 62° latitude were estimated at 300 million tons of crude oil and 500 billion cubic meters of natural gas. This estimate applied to early 1974 and does not include reserves in the Statfjord Field. Total potential reserves south of 62° latitude were estimated by the Norwegian Petroleum Directorate at 1 to 2 billion tons of oil and 1 to 2 trillion cubic meters of gas.

*Trade, Refining, and Consumption.*—Gradually increasing production of crude oil from the Ekofisk Field led to exports of 1.98 million tons of crude oil in 1974, 29% more than in 1973. The oil was valued at $152 million. Exports of petroleum products totaled 2.06 million tons, of which fuel oils made up 80%.

Despite rising crude oil production, Norway continued to import crude oil for refining in addition to large quantities of petroleum products. Imports of crude oil in 1974 totaled 6.7 million tons, about 5% less than in 1973. Imports of petroleum products totaled 3.9 million tons, including 2 million tons of fuel oil and 745,000 tons of gasoline.

Construction of the petroleum refinery at Mongstad continued; completion was scheduled during the first half of 1975. Refining capacity will be 4 million tons per year of crude oil. A/S Rafinor, the operating company, is owned 60% by

[7] Phillips Petroleum Co. 1974 Annual Report. Pp. 5–10.

[8] Ministry of Industry (Oslo). Report No. 30 to the Norwegian Storting, 1973–74—Operations on the Norwegian Continental Shelf. P. 14.

Norsk Hydro and 40% by Norsk Braendselolje A/S. When this refinery is completed, refining capacity in Norway will be 12 million tons of crude oil per year.

Statoil and Norske Shell A/S made an agreement by which the Shell refinery at Sola was to process 410,000 tons of crude oil for the Government during 1974. The crude oil was to be delivered by the Phillips Group in lieu of cash royalties for production in the Ekofisk Field.

In June 1974, the Government approved plans for development of a petrochemicals industry in Norway, based on wet natural gas to be produced from the Frigg Field. Production facilities planned at Frierfjord, in Bamble, include an ethylene cracker and plants for chlorine-alkali and vinyl chloride. These plants will be operated by Norsk Hydro and are planned for completion by 1977. Plants for production of polyolefins, to be built later, will be operated by Saga Petroleum A/S & Co., with Saga, Norsk Hydro, and Statoil each owning one-third.

Inland consumption of refinery products in 1973 and 1974 was as follows, in thousand metric tons:

| Refinery product | 1973 | 1974 |
|---|---|---|
| Aviation fuels | 281 | 254 |
| Gasoline | 1,128 | 1,049 |
| Kerosine | 466 | 294 |
| Gas and diesel oil | 3,131 | 2,569 |
| Residual fuel oil | 1,927 | 1,869 |
| Other | 1,062 | 1,034 |
| Total | 7,995 | 7,069 |

Source: Organization for Economic Cooperation and Development (OECD), Paris. Provisional Oil Statistics by Quarters, 4th Quarter 1974. 1975, 21 pp.

# The Mineral Industry of Pakistan

By Frank B. Fulkerson [1]

Pakistan was placing greater emphasis on the development of its mineral resources. In 1974 the Central Government increased financial allocations for exploration of copper, iron ore, phosphate, and other mineral deposits. More attention was being given to the extreme northern areas of Gilgit, Chitral, Dir, and Swat, where mineral wealth is largely unexplored.

Two government-owned corporations were formed to promote the development of mineral resources. The Resources Development Corp. (RDC) was given responsibility for drilling and developing the Saindak copper deposit in western Baluchistan. The Mineral Development Corp. (MDC), formed by merging several government-owned coal and salt mining firms, has the responsibility for mineral prospecting and development activities of the Government except for Saindak copper, uranium, natural gas, and petroleum. The MDC's first project was to be an evaluation of Indus River gold placer deposits in Gilgit.

Under a high government priority, the public sector Oil & Gas Development Co. (OGDC) and several U.S. oil companies continued to explore for oil in Pakistan. In 1974 Pakistan imported 88% of its petroleum requirements at a cost of over $150 million.[2]

Natural gas is the principal product of Pakistan's mining industry. In 1974, Pakistan ranked sixth in Asia in marketed production of natural gas. All the gas was consumed domestically in power generation, fertilizer and cement manufacturing, other industrial uses, and commercial and household uses. Pakistan's reserves of natural gas were estimated to be 15.4 trillion cubic feet, enough for 100 years at the 1974 rate of production.

The country's first steel plant was under construction in 1974, and capacity for refining oil and producing cement and chemical fertilizers was being greatly expanded.

The gross national product (GNP) at current prices increased 27.7% in fiscal year 1973–74 to $7,860 million. Most of the increase was due to higher prices caused by devaluation, international inflation, and monetary factors. GNP at constant prices gained 6.1% in 1973–74.

Except for extraction of crude oil and natural gas, private sector mining continued to be of limited significance. The main operations in the private sector were chromite mining at Muslimbagh, Baluchistan; quarrying of dimension stone; and some coal mining. In 1974 Pakistan Petroleum Ltd., and the Government of Baluchistan began a joint venture for mining and processing barite.

## PRODUCTION

Sizable quantities of the following mineral commodities were produced in the four provinces of Pakistan: Natural gas, crude oil, coal, chromite, barite, clays, gypsum, sand, gravel, dimension stone, crushed stone, and salt. Also, such finished mineral products as chemical fertilizers and refined petroleum were produced. Requirements for iron and steel and nonferrous metal products were met by imports.

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[1] Industry economist, Division of Nonmetallic Minerals.

[2] Where necessary, values have been converted from Pakistani rupees (PRs) to U.S dollars at a rate of PRs9.90 = US$1.00.

## Table 1.—Pakistan: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **METALS** | | | |
| Aluminum, bauxite, gross weight | r 768 | 117 | 274 |
| Antimony ore: | | | |
| Gross weight | r 114 | 41 | 164 |
| Metal content e | r 23 | 8 | 33 |
| Chromium, chromite, gross weight | r 26,588 | 17,046 | 9,586 |
| Iron and steel, mild steel products [1] thousand tons | 186 | 210 | 211 |
| Manganese ore, gross weight | r 117 | 61 | 7 |
| **NONMETALS** | | | |
| Abrasives, natural, emery stone | r 1,725 | 438 | 214 |
| Barite | r 2,119 | 2,129 | 4,825 |
| Cement, hydraulic thousand tons | r 2,662 | 2,905 | 3,503 |
| Chalk | r 453 | 537 | 1,458 |
| Clays: | | | |
| Bentonite | r 461 | 970 | 545 |
| Fire clay | r 16,168 | 48,079 | 15,944 |
| Fuller's earth | r 15,254 | 12,195 | 16,579 |
| Kaolin (china clay) | r 1,142 | 602 | 1,236 |
| Other [2] | r 70,171 | 109,520 | 69,315 |
| Feldspar | r 371 | 1,211 | 3,396 |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous [3] | | | |
| Gross weight | r 573,010 | 668,823 | 649,206 |
| Nitrogen content | r 252,142 | 292,636 | 278,516 |
| Phosphatic, gross weight | r 38,614 | 38,147 | 21,171 |
| Fluorspar | r 1,221 | 847 | 69 |
| Gypsum, crude | r 109,989 | 178,155 | 273,279 |
| Magnesite, crude | r 78 | 3,423 | 2,915 |
| Natron, manufactured (soda ash) | r 71,575 | 77,488 | 80,805 |
| Pigments, natural mineral, ocher | r 4,318 | 6,183 | 15,140 |
| Salt: | | | |
| Rock thousand tons | r 382 | 378 | 386 |
| Marine do | r 212 | 165 | 134 |
| Total do | r 594 | 543 | 520 |
| Sand and gravel: | | | |
| Gravel | r 65,047 | 50,722 | 85,603 |
| Sand: | | | |
| Bajri [4] | 7,550 | -- | 1,031 |
| Common [5] | r 11,111 | 19,910 | 39,441 |
| Glass [6] | r 34,524 | 35,522 | 38,260 |
| Stone: | | | |
| Aragonite | r 33,903 | 718,865 | 723,611 |
| Dolomite | r 88 | 156 | 612 |
| Limestone thousand tons | r 2,599 | 2,723 | 3,205 |
| Marble | r 1,706 | (7) | (7) |
| Crushed [5] [5] | r 67,936 | 620,553 | 2,445,634 |
| Strontium minerals, celestite | r 290 | 3 | 363 |
| Sulfur [9] | r 2,430 | 2,798 | 2,128 |
| Talc and related materials, soapstone | r 3,476 | 5,962 | 7,054 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Coal, all grades thousand tons | r 876 | 813 | e 800 |
| Gas, natural, sales e million cubic feet | 118,000 | 138,000 | 152,000 |
| Natural gas liquids thousand 42-gallon barrels | 65 | e 70 | 30 |
| Petroleum: | | | |
| Crude oil do | 3,294 | 2,871 | 2,923 |
| Refinery products: | | | |
| Gasoline do | 4,173 | 2,567 | 2,177 |
| Jet fuel do | 2,409 | 2,995 | 3,317 |
| Kerosine do | 3,596 | 2,642 | 2,256 |
| Distillate fuel oil do | 6,772 | 5,923 | 5,855 |

See footnotes at end of table.

**Table 1.—Pakistan: Production of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Petroleum—Continued | | | | |
| Refinery products—Continued | | | | |
| Residual fuel oil | thousand 42-gallon barrels | 9,736 | 8,106 | 8,813 |
| Lubricants | do | 343 | 569 | 611 |
| Other | do | 1,499 | 1,129 | 1,374 |
| Refinery fuel and losses | do | 1,426 | 923 | 951 |
| Total | do | 29,954 | 24,854 | 25,354 |

e Estimate. p Preliminary. r Revised.
[1] As reported in source, types of products not specified.
[2] Sind Province only; additional quantities may be produced in other provinces, but are not reported.
[3] Data are for urea and ammonium sulfate only; ammonium nitrate presumably is still produced, but recent data are not available owing to Pakistan Government restrictions. In the year ending June 30, 1965 (latest data available), ammonium nitrate output totaled 76,086 tons (gross weight) with an indicated nitrogen content of 26,630 tons.
[4] As reported by North-West Frontier Province only; no details on the nature of this sand are available.
[5] Punjab and Sind Provinces only; additional quantities may be produced in other provinces.
[6] Punjab, Sind, and North-West Frontier Provinces only; additional quantities may be produced in other provinces.
[7] Aragonite and marble are reported inseparably, and the combined figure has been entered under aragonite.
[8] Reported in source as ordinary stone.
[9] Produced in Baluchistan Province only; type of sulfur not reported.

## TRADE

Pakistan's foreign trade was hurt by world inflation and recession. The country's trade balance changed from a small surplus of $20 million in 1972–73 to a record deficit of $344 million in 1973–74. Value of exports increased 26% to $1,026 million, but value of imports rose much faster and climbed 72% to $1,371 million. Rice and cotton manufactures were the principal exports. Wheat, fertilizers, petroleum, iron and steel, machinery, and transportation equipment were the leading imports.

An Indo-Pakistan protocol was signed in November that lifted the embargo on trade between the two countries. The protocol noted that there might be immediate possibilities of commencing trade in iron ore and other commodities.

Pakistan further liberalized its import policy. Eighteen new items were added to the duty-free import list. Most of the new items were industrial raw materials or capital goods, including iron and steel plates and sheets, lubricants and greases, nonferrous metal manufactures, and mining equipment.

The following tabulations list the value of Pakistan's mineral-industry exports and imports. In addition, table 2 supplies quantitative data for mineral industry exports.

| Commodity or commodity group | Value of exports and reexports (million dollars) | |
|---|---|---|
| | 1972–73 r | 1973–74 |
| Chromite | 1.1 | (1) |
| Other metallic ores | (1) | (1) |
| Metals including scrap | .9 | 1.6 |
| Cement | 10.9 | 16.0 |
| Gem stones except diamond | .9 | .7 |
| Salt | .2 | .1 |
| Stone, sand and gravel | 1.4 | .3 |
| Petroleum and petroleum refinery products | 14.4 | 17.5 |
| Other | .2 | 3.1 |
| Total | 30.0 | 39.3 |

r Revised.
[1] Less than $50,000.

| Commodity or commodity group | Value of imports (million dollars) | |
|---|---|---|
| | 1972–73 r | 1973–74 |
| Iron and steel including ores and scrap | 91.9 | 104.8 |
| Other metals including ores and scrap | 22.3 | 38.1 |
| Fertilizer materials | 45.8 | 90.1 |
| Coal and coke | 3.8 | 5.2 |
| Crude and partly refined petroleum | 51.8 | 105.3 |
| Petroleum refinery products | 20.8 | 45.3 |
| Other | 10.9 | 8.2 |
| Total | 247.3 | 397.0 |

r Revised.

## Table 2.—Pakistan (excluding Bangladesh): Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972–73 | 1973–74 |
|---|---|---|
| **METALS** | | |
| Aluminum metal including alloys, semimanufactures | -- | 12 |
| Chromium ore and concentrates | 27,118 | 1,000 |
| Copper metal including alloys, all forms | 3 | 172 |
| Iron and steel: | | |
| Ore and concentrate | -- | 1 |
| Scrap | 5 | 10 |
| Semimanufactures | 103 | 5,587 |
| Lead metal including alloys, all forms | -- | 4 |
| Nickel metal including alloys, all forms | -- | 3 |
| Platinum ---- troy ounces | 4,200 | -- |
| Tin ---- long tons | 1 | 7 |
| Other ores and concentrates, n.e.s | 9 | -- |
| **NONMETALS** | | |
| Abrasives, natural, grinding and polishing wheels and stones ---- value, thousands | r $5 | $3 |
| Barite | 1,016 | -- |
| Cement | r 697,854 | 778,691 |
| Chalk, crude | 2 | 2 |
| Clays and clay products: | | |
| Crude clays, n.e.s.: | | |
| Fire clay | 2 | 46 |
| Other | -- | 9 |
| Products: | | |
| Refractory | r 136 | 265 |
| Nonrefractory | 5 | 131 |
| Diamond, gem, not set or strung ---- value, thousands | -- | $28 |
| Feldspar and fluorspar | (1) | -- |
| Fertilizer and fertilizer materials, manufactured | 5,332 | 278 |
| Gem stones except diamond ---- kilograms | r 53,459 | 36,493 |
| Mica, crude and worked | 20 | 114 |
| Salt | r 17,160 | 5,808 |
| Stone, sand and gravel: | | |
| Dimension stone | 12,397 | 11,861 |
| Crushed and broken stone | 56 | 200 |
| Talc, steatite, soapstone, and pyrophyllite | 2,700 | 766 |
| Other nonmetals, n.e.s | -- | 5 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 3,750 | 36,159 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Asphalt and bitumen, natural | r 4,598 | 4,577 |
| Coal and coke | 300 | -- |
| Gas, hydrocarbon: | | |
| Natural ---- value, thousands | (1) | $4 |
| Manufactured ---- do | (2) | -- |
| Petroleum: | | |
| Partly refined ---- thousand 42-gallon barrels | (2) | -- |
| Topped crude[3] ---- do | r 816 | 386 |
| Refinery products: | | |
| Gasoline ---- do | (2) | (2) |
| Kerosine and jet fuel ---- do | r 1 | 9 |
| Distillate fuel oil ---- do | 1,070 | 155 |
| Residual fuel oil ---- do | 3,522 | 1,483 |
| Lubricants ---- do | r 121 | 4 |
| Other: | | |
| Asphalt ---- do | r 75 | (2) |
| Unspecified ---- do | (2) | (2) |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 4 | -- |

r Revised.
1 Revised to none.
2 Less than ½ unit.
3 Reported in source as "topped crude—naphtha."

## COMMODITY REVIEW

### METALS

**Bauxite.**—A small tonnage of bauxite was produced in Punjab Province. Deposits of bauxitic clays in the Salt Range and Kala Chitta areas of the province were being investigated.

**Chromite.**—Production of chromite declined from 17,046 tons in 1973 to 9,586 tons in 1974. The bulk of the output, from the Muslimbagh area of Baluchistan, was exported. Pakistan Chrome Mines Ltd., was studying the feasibility of setting up a ferrochrome plant based on the Muslimbagh chromite.

**Copper.**—Work completed in 1974 by the RDC and the Geological Survey of Pakistan indicated the Saindak copper deposit near the Pakistan-Iran border in Chagai District, Baluchistan, contains 250 million tons of ore with average copper content of 0.5%. Difficulties encountered in this project include remoteness of the area and lack of water. The search continued for nearby underground water sources.

**Iron and Steel.**—A large steel mill was under construction, and a small one was in the planning stage. Progress was reported to be good on a 1.1-million-ton-capacity mill being built outside Karachi by the government-owned Pakistan Steel Mills Corp. with extensive financial and technical assistance from the U.S.S.R. The mill was to reach full capacity by 1980. A bulk cargo port was being built at Quasim to handle iron ore and coking coal imports for the plant. The new port will avoid further congestion at the port of Karachi.

Work continued on evaluating iron ore reserves in Chagai District, Baluchistan Province. If reserves of iron ore are adequate, a ministeel mill will be established in the district by the Pakistan Government, reportedly with financial assistance from the People's Republic of China.

In 1974 Pakistan produced a limited quantity of steel in scrap-fed electric furnaces. Requirements for steel were met mainly by imports. The cost of imported iron and steel in fiscal year 1973–74 was $105 million.

**Uranium.**—Pakistan's Atomic Energy Commission revealed ambitious plans for nuclear energy. According to the commission, Pakistan has discovered enough deposits of uranium in the Dera Ghazi Khan area of Punjab and elsewhere to meet all domestic requirements in the foreseeable future. By yearend 1975, Pakistan will be able to provide nuclear fuel for its nuclear powerplant in Karachi. Also, construction on the 600-megawatt Chashma Barrage nuclear powerplant was to begin in 1975. The plan was to build several similar plants during the 1980's.

### NONMETALS

**Barite.**—Pakistan Petroleum Ltd. and the Government of Baluchistan Province began a joint venture called Bolan Mining Enterprises for mining and processing barite from a deposit near the village of Khuzdar in the Central Makran Mountain Range. The deposit was estimated to contain over 1.3 million tons of ore. It was expected that the bulk of the output would be exported. This new project should significantly increase Pakistan's barite production. Barite was used mainly as a weighting material in oil- and gas-well drilling fluids. Other barite deposits have been located in the North-West Frontier Province (NWFP).

**Cement.**—Cement production continued to increase to meet rising local demand as well as export commitments to a number of countries in the Middle East. The State Cement Corporation of Pakistan was reported to have undertaken four projects, each of 300,000-ton-per-year capacity, to expand the cement industry. All the cement plants in the country were under State control. Seven plants were under the State Cement Corp., and the remaining two were under the Ministry of Production.

**Fertilizer Materials.**—Extensive deposits of phosphate rock that reportedly could provide all of Pakistan's requirements for phosphate were being developed near Abbottabad in Hazara District, NWFP. A fertilizer complex based on these deposits was being planned. The plant, which would be under the jurisdiction of the NWFP Sarkand Development Authority, would produce superphosphate, diammonium phosphate, and phosphoric acid. A plant to produce urea also was to be built in the same area. Presumably the phosphate plant would be able to use the urea plant's ammonia facilities.

A $100 million project was begun to expand the Multan fertilizer plant. The new plant, a joint venture of Pakistan and Abu Dhabi, will produce nitric acid, calcium ammonium nitrate, and ammonia. Natural gas will be secured from the Sui gasfield.

Pakistan plans to become self-sufficient in chemical fertilizers by 1980. The cost of importing these fertilizers in 1973–74 was $90 million.

**Sulfur.**—A small tonnage of native sulfur was produced in the Koh-i-Sultan range, Baluchistan. Production was entirely by hand labor, using open pit methods.

## MINERAL FUELS

**Coal.**—The Government proposed to establish a 250-megawatt thermal power-plant near large coal deposits that have been discovered at Lakra, Dadu District, Sind.

**Natural Gas.**—Production of natural gas from the Dhulian oilfield and the Mari and Sui gasfields increased over that of 1973. Pakistan has large reserves of natural gas in these fields and in fields still lying dormant. A shortage of gas at the Karachi industrial complex was to be relieved by the end of 1976 when a new 300-mile Sui-Karachi pipeline is completed. The pipeline is being financed by the Asian Development Bank.

**Petroleum.**—Crude oil production, from the Potwar Plateau in northwestern Punjab, totaled 400,000 tons, which met only 12% of Pakistan's oil requirements. Rising prices for imported oil was a serious problem. Cost of imported crude and refined products reached $151 million in the fiscal period 1973–74. Several international oil companies and the OGDC were looking for oil in Pakistan. Also, a number of oil well service companies established offices in the country. The petroleum potential of the Indus and Baluchistan Basins and offshore areas was believed to be good.

Abu Dhabi and Pakistan are participating in a joint venture called Pak-Arab Refinery Ltd., to construct a new petroleum refinery at Multan. The refinery will cost $42 million and will have a capacity of 40,000 barrels per day. Crude oil will be imported from Abu Dhabi through the port of Karachi. The refinery was expected to be completed by 1977. There were three petroleum refineries in Pakistan in 1974, two at Karachi, and one at Rawalpindi.

Pakistan was constructing a new oil berth at Karachi, which handles all the country's seaborne imports and exports. The berth will accommodate 75,000 deadweight-ton tankers. The $23.9 million project will enable the port to handle expected oil traffic until the early 1980's.

In March, Pakistan Texasgulf Inc., a subsidiary of Texasgulf Inc., of Houston, Tex., signed a concession agreement for a 11,200-square-mile area, primarily in Sind but with portions in Punjab and Baluchistan. Also, Trend Pakistan Corp., a subsidiary of Trend Exploration, Ltd., Denver, Colo. signed a concession agreement on almost 15,000 square miles in Baluchistan.

# The Mineral Industry of Peru

By F. W. Wessel [1]

Peru's mineral industry contributed $543 million [2] to the national gross domestic product (GDP) in 1974, according to the Sociedad Nacional de Minería. This amount accounted for 7.0% of the GDP; the revised figure for 1973 was 7.3%. However, the value of mineral production was 3.2% greater than in 1973. Peru's mineral exports totaled $841 million, representing a 46.4% increase from the 1973 level. In both years mineral exports accounted for about 55% of total exports.

Peru received external loan commitments of $1.55 billion from January 1, 1973, through September 30, 1974. This amount included loans for the Transandean pipeline, the Empresa Siderúrgica del Perú (SIDERPERU) steel mill at Chimbote, and Cuajone copper development. In November an $8 million loan was obtained from Canada for development of 15 medium-sized mines in Peru. In all, Peru has borrowed from 17 countries over a 2-year period.

By Decree Law 20488, the Government of Peru, in December 1973, established the Ministry of Commerce, whose main responsibility was defined as development of domestic and foreign trade. Included in the new ministry were the existing marketing organizations which handled, among other items, minerals and metals, petroleum, and fertilizers. Decree Law 20784, of November 5, 1974, created an agency named "Minero-Perú Comercial" (MINPECO). This agency was to be responsible for all sales of Peruvian mineral products, including those of private mining companies; as such, it relieves Empresa Minera del Perú (Minero Perú) of this function.

There were 38 strikes in the mining industry during 1974. This was less than half as many as occurred in 1973; nevertheless, losses amounted to 1.8 million man-hours and 1.2 billion soles worth of production.

The Peruvian Times, a weekly English-language magazine which was a major source of mineral information on Peru, was lost indefinitely when, as a result of publication of details of a $330 million contract between Empresa Petróleos del Perú (Petroperú) and several Japanese companies involved in building the Transandean pipeline, it was closed down in November by the Government. This action received general approval by other Lima newspapers, which were taken over by the Government in July.

Decree Law 20492, issued on December 29, 1973, effected the expropriation of the assets, within Peru, of the Cerro de Pasco Corp. The company was renamed Empresa Minera del Centro del Perú (CENTROMIN) and will be headed by an Administrator, Victor Miro Quesada, a retired army general, who will report to the Minister of Energy and Mines. The investments of the parent corporation, Cerro Corp., in other Peruvian mining companies were not affected.

Cerro de Pasco Corp. held, as its principal assets, several developed and operating mines, hydroelectric powerplants, and the smelter complex at La Oroya. In 1973 the company's production included 67,500 tons of zinc; 83,500 tons of lead; 58,000 tons of copper; 95,000 tons of zinc concentrate; 18.1 million troy ounces of silver; and 36,600 troy ounces of gold.

The matter of compensation for assets at an estimated book value of $145 million was settled in an agreement reached in February. Under its terms, Cerro Corp. re-

[1] Physical scientist, Division of Nonferrous Metals.
[2] Where necessary, values have been converted from Peru soles (S/) to U.S. dollars at the rate of S/38.7=US$1.00.

ceived $58 million and will probably receive an additional $8 million to $12 million about February 1975. The company will also have a $138 million loss applicable against its U.S. taxable income over a 10-year period.

In December 1974, it was reported that Marcona Corp. and the Peruvian Government were discussing the sale of Marcona Mining Co. to Peru. Marcona Corp. is controlled by Cyprus Mines Corp. and Utah International Inc., each of whom owns 46%. Up for sale is a package which includes Marcona's iron ore concessions in Ica, 250 miles southeast of Lima, with reserves estimated at 300 million to 400 million tons, plus substantial quantities of lower grade material. These concessions expire in 1982. Also included are the nearby La Justa deposit, with 40 million tons reserve; the San Nicolas processing complex of 10.5 million tons of yearly capacity; the transportation facilities between the mine and San Nicolas; and shiploading facilities at San Nicolas.

## PRODUCTION

In terms of 1974 mine output, Peru's copper production increased 1.9%, lead production increased 1.0%, and zinc production decreased 5.4%. Gold production, responding to active government assistance, increased 28.8%, but silver production decreased 4.2%. Refinery production of copper remained unchanged from 1973. Zinc refinery production increased 2.4%. Lead smelter production decreased 3.6% and mercury production decreased 9.1%.

In the ferrous area, iron ore production increased 6.3%, steel production increased 27.7%, but manganese ore production decreased 64.6%.

Cement production was 9.2% higher than in 1973, and estimated barite production was slightly higher.

Crude petroleum production was 9.6% greater than in 1973, and refinery throughput increased 4.1%. Gross natural gas output increased 9.1%, but marketed gas was 7.1% less. Marketed gas was 45% of the total produced.

**Table 1.—Peru: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **METALS** | | | |
| Antimony: | | | |
| Mine output, metal content | 749 | 770 | 616 |
| Metal (content of antimonial lead bars) | 370 | 324 | 266 |
| Arsenic, white | 1,019 | 1,386 | 1,973 |
| Bismuth: | | | |
| Mine output, metal content | 725 | 572 | 659 |
| Metal | 665 | 512 | 615 |
| Cadmium: | | | |
| Mine output, metal content | 517 | 562 | 460 |
| Metal | 210 | 212 | 182 |
| Copper: | | | |
| Mine output, metal content | 219,126 | 218,814 | 222,944 |
| Copper sulfate | 867 | 1,074 | 1,081 |
| Metal: | | | |
| Blister | 137,040 | 138,066 | 144,150 |
| Refined | 39,213 | 38,976 | 38,955 |
| Gold: | | | |
| Mine output, metal content, troy ounces | 86,421 | 104,490 | 134,592 |
| Metal, do | 51,827 | 52,727 | 68,000 |
| Indium, kilograms | r 2,944 | 3,459 | 2,369 |
| Iron and steel: | | | |
| Iron ore and concentrate, thousand tons | 9,414 | 8,964 | 9,526 |
| Pig iron (excluding blast furnace ferroalloys), do | 163 | 256 | 290 |
| Steel, ingot and casting, do | 181 | 357 | 456 |
| Lead: | | | |
| Mine output, metal content | 184,381 | 199,164 | 201,235 |
| Metal | r 85,558 | 83,269 | 80,234 |
| Manganese: | | | |
| Ore and concentrate, gross weight | r 9,089 | 7,778 | 2,756 |
| Metal content | r 2,736 | 2,341 | 854 |
| Mercury, 76-pound flasks | r 4,542 | 3,580 | 3,253 |
| Molybdenum, mine output, metal content | 766 | 722 | 648 |
| Selenium, kilograms | 8,021 | 7,689 | 7,747 |

See footnotes at end of table.

## Table 1.—Peru: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| **METALS—Continued** | | | | |
| Silver: | | | | |
| Mine output, metal content | thousand troy ounces | 40,370 | 42,021 | 40,249 |
| Metal | do | r 20,266 | 16,645 | 17,650 |
| Tellurium metal | kilograms | 1,789 | 26,251 | 36,474 |
| Tin, mine output, metal content | long tons | 124 | 218 | 166 |
| Tungsten, mine output, metal content | | 954 | 795 | 689 |
| Zinc: | | | | |
| Mine output, metal content | | 376,129 | 413,733 | 391,323 |
| Metal, refined | | 69,810 | 69,645 | 71,323 |
| **NONMETALS** | | | | |
| Barite | | r 193,532 | e 220,000 | e 227,000 |
| Cement, hydraulic | thousand tons | 1,627 | 1,742 | 1,902 |
| Chalk | | 905 | e 900 | e 900 |
| Clays: | | | | |
| Bentonite | | 5,597 | e 5,600 | e 5,600 |
| Fire | | 19,977 | e 20,000 | e 20,000 |
| Kaolin | | 1,086 | e 1,100 | e 1,100 |
| Common | | 91,528 | e 95,000 | e 95,000 |
| Diatomite | | 3,160 | e 3,100 | e 3,100 |
| Feldspar | | 1,931 | e 2,000 | e 2,000 |
| Gypsum: | | | | |
| Crude | | 81,216 | e 90,000 | e 90,000 |
| Calcined | | 64,753 | e 71,000 | e 71,000 |
| Lime | | 5,625 | e 10,000 | e 10,000 |
| Phosphate, guano e | | 23,000 | 23,000 | 23,000 |
| Salt, all types | | 216,144 | e 220,000 | e 220,000 |
| Stone: | | | | |
| Dimension: | | | | |
| Marble 1 | | 1,548 | e 1,600 | e 1,600 |
| Slate | | 22 | e 25 | e 25 |
| Crushed and broken: | | | | |
| Dolomite | | -- | e 4,000 | e 4,000 |
| Gravel and sand | thousand tons | 2,257 | e 2,300 | e 2,300 |
| Limestone | do | 1,826 | e 1,900 | e 1,900 |
| Quartzite | | 5,470 | e 5,500 | e 5,500 |
| Silica | | 53,780 | e 54,000 | e 54,000 |
| Talc, pyrophyllite, and related materials | | 9,941 | e 10,000 | e 10,000 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | |
| Coal: | | | | |
| Anthracite | | 29,344 | e 30,000 | e 30,000 |
| Bituminous e | | 75,000 | 75,000 | 80,000 |
| Coke, all types | | 33,825 | e 35,000 | e 35,000 |
| Gas, natural: | | | | |
| Gross production | million cubic feet | r 64,440 | 64,005 | 69,848 |
| Marketed | do | r 31,144 | 34,184 | 31,757 |
| Natural gas liquids: | | | | |
| Natural gasoline 2 | thousand 42-gallon barrels | 447 | 449 | 453 |
| Propane | do | 308 | 296 | 210 |
| Butane | do | 2 | 3 | 5 |
| Total | do | 757 | 748 | 668 |
| Petroleum: | | | | |
| Crude | do | 23,644 | 25,767 | 28,230 |
| Refinery products: | | | | |
| Aviation gasoline | do | 4 | 2 | 3 |
| Motor gasoline | do | 10,897 | r 11,746 | 11,812 |
| Jet fuel | do | 1,513 | 1,743 | 1,915 |
| Kerosine | do | 4,427 | r 4,495 | 4,596 |
| Distillate fuel oil | do | 6,680 | 7,123 | 7,325 |
| Residual fuel oil | do | 9,528 | 10,921 | 12,763 |
| Lubricants | do | r 240 | r 379 | 86 |
| Other: | | | | |
| Liquefied petroleum gas | do | 469 | 516 | 534 |
| Asphalt | do | 206 | 237 | 216 |
| Unspecified | do | r 92 | 522 | 116 |
| Refinery fuel and losses | do | 442 | 445 | 321 |
| Total | do | r 34,498 | r 38,129 | 39,687 |

e Estimate. p Preliminary. r Revised.

1 Includes crushed marble.

2 Includes hexane.

## TRADE

In 1974 Peru's total exports reached $1,520 million in value, a 46% increase over 1973 levels. Of this total, mineral exports amounted to $841 million, accounting for 55% of total exports and recording an increase over 1973 also of 46%. Copper at 186,000 tons remained Peru's principal mineral export, although 2% less in quantity than in 1973. Exports of lead and iron ore were 1% and 7% less than in 1973, respectively, but silver exports were 18% higher and zinc exports 5.5% higher.

Minero Perú began shipping 100,000 tons of copper concentrates to North Korea, pursuant to a trade agreement. The shipments will extend through 1975.

Peru's total imports in 1974 were $1,530.5 million. Imports of minerals, mineral products, and mineral fuels, at $123.1 million, accounted for 8% of the total.

Peru imported 11.9 million barrels of crude oil during the year, and 3.7 million barrels of refinery products; this was 8% less crude and 48% more products than in 1973.

Table 2.—Peru: Quantity and value of selected major mineral commodity exports, 1972–74

| Commodity | Quantity (metric tons) | | | Value, f.o.b. (millions) | | |
|---|---|---|---|---|---|---|
| | 1972 | 1973 | 1974 | 1972 | 1973 | 1974 |
| Copper content of ores, concentrates and smelter products | 218,467 | 190,319 | 185,937 | $183 | $284 | $284 |
| Iron ore, gross weight | 8,618,000 | 8,708,000 | [1]8,063,000 | 65 | 61 | 61 |
| Lead content of ores, concentrates, and smelter products | 165,743 | 165,900 | 163,644 | 33 | 42 | 43 |
| Silver content of ores, concentrates, and smelter products | 1,289 | 1,059 | 1,251 | 62 | 68 | 68 |
| Zinc content or ores, concentrates, and smelter products | 398,986 | 403,600 | 426,019 | 69 | 93 | 93 |

[1] Calculated from reported iron content of 5,582,000 metric tons on the basis of the grade of exported material in 1973.

Source: 1971—U.S. Embassy, Lima, Peru. State Department Airgram A–115, Apr. 6, 1972; 1972—U.S. Embassy, Lima Peru. State Department Airgram A–62, Mar. 14, 1973; 1973—U.S. Embassy, Lima, Peru. State Department Airgram A–115, July 18, 1974.

Table 3.—Peru: Exports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1971[1] | 1972[2] | 1973[3] | Principal destinations, 1973[3] |
|---|---|---|---|---|
| METALS | | | | |
| Aluminum metal including alloys, unwrought and semimanufactures | 61 | NA | NA | NA. |
| Antimony ore and concentrate | 714 | [4]1,034 | [4]584 | NA. |
| Arsenic trioxide | 43 | NA | NA | NA. |
| Bismuth metal including alloys, all forms | 559 | [4]451 | [4]192 | |
| Cadmium metal including alloys, all forms | 168 | [4]147 | [4]45 | |
| Copper: | | | | |
| Ore and concentrate | 155,869 | 100,037 | 94,424 | Japan 84,960; United States 7,889. |
| Matte | 2,775 | 2,535 | 664 | All to Spain. |
| Copper sulfate | 1,118 | NA | NA | |
| Metal including alloys: | | | | |
| Unwrought:[5] | | | | |
| Blister | 126,964 | [4]143,107 | [4]133,150 | United States 83,138; Japan 17,460; West Germany 14,328; Belgium-Luxembourg 12,972. |
| Refined | 25,126 | [4]28,936 | [4]22,716 | People's Republic of China 11,800; United States 3,503; Argentina 3,429. |

See footnotes at end of table.

Table 3.—Peru: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1971[1] | 1972[2] | 1973[3] | Principal destinations, 1973[3] |
|---|---|---|---|---|
| METALS—Continued | | | | |
| Copper—Continued | | | | |
| Metal including alloys—Continued | | | | |
| Semimanufactures | 332 | 70 | 549 | United Kingdom 200; Japan 199; United States 150. |
| Gold: | | | | |
| Ore and concentrate, gross weight kilograms | 1,182 | [4]1,064 | [4]1,922 | NA. |
| Metal, content of mixed bars troy ounces | 5,337 | [4]7,845 | [4]6,591 | NA. |
| Iron and steel: | | | | |
| Ore and concentrate (excluding pyrite) thousand tons | 9,114 | 8,738 | 8,627 | Japan 6,133; United States 1,525. |
| Metal: | | | | |
| Pig iron, including cast iron | 707 | NA | NA | |
| Semimanufactures | 1,143 | NA | NA | |
| Lead: | | | | |
| Ore and concentrate | 169,840 | 130,231 | 93,109 | Japan 36,862; United States 21,802; Belgium-Luxembourg 15,849. |
| Metal including alloys, all forms[5] | 62,682 | [4]77,250 | [4]60,738 | United States 33,944; Japan 5,611; People's Republic of China 4,378; Italy 3,693. |
| Mercury 76-pound flasks | 2,332 | [4]4,032 | [4]2,813 | NA. |
| Molybdenum ore and concentrate | 761 | [6][7]613 | [6][7]2,180 | West Germany 1,124; France 504; Belgium-Luxembourg 363. |
| Platinum-group metals, waste and sweepings troy ounces | 236,275 | NA | NA | |
| Selenium, elemental | 6 | NA | NA | |
| Silver: | | | | |
| Ore and concentrate thousand troy ounces | 17,329 | [4]18,537 | [4]20,018 | NA. |
| Metal including alloys do | 13,800 | [4]22,899 | [4]14,240 | NA. |
| Tellurium, elemental | 21 | NA | NA | |
| Tin: | | | | |
| Ore and concentrate long tons | 337 | 2,060 | 1,082 | United Kingdom 856; Netherlands 226. |
| Metal including alloys, all forms do | 191 | 489 | 214 | Japan 99; Netherlands 50; Belgium-Luxembourg 25. |
| Tungsten ore and concentrate | 932 | 1,251 | 1,840 | United Kingdom 691; United States 471; Japan 301; Netherlands 149. |
| Zinc: | | | | |
| Ore and concentrate | 538,167 | 673,406 | 638,106 | Japan 324,310; France 124,829; West Germany 42,207; Italy 29,669. |
| Oxide | 87 | NA | NA | |
| Metal including alloys, all forms | 51,402 | [4]54,002 | [4]35,879 | United States 17,548. |
| Other: | | | | |
| Ore and concentrate | -- | [8]11,541 | [8]25,095 | Canada 24,027. |
| Scrap and waste, nonferrous, n.e.s | -- | 11,874 | 106,082 | All to Spain. |
| Metal including alloys, all forms value, thousands | $47 | $6,819 | $5,442 | United States $3,023. |
| NONMETALS | | | | |
| Barite and witherite | 86,552 | [8]191,429 | [8]242,677 | United States 182,344; Netherlands 60,333. |
| Cement, hydraulic | 19,951 | [9]3,493 | (9) | |
| Clays: | | | | |
| Bentonite | 149 | NA | NA | |
| Kaolin | 14 | NA | NA | |
| Fertilizer materials, crude | 1,827 | 2,722 | 931 | All to West Germany. |
| Gypsum | 3 | NA | NA | |
| Precious and semiprecious stones, including diamond thousand carats | 2,000 | NA | NA | |
| Salt | 469 | 297 | -- | |
| Stone, sand and gravel: | | | | |
| Stone: | | | | |
| Marble | 661 | NA | NA | |
| Travertine | 112 | NA | NA | |
| Sand, not metal bearing | 797 | NA | NA | |
| Other crude minerals value, thousands | -- | $1,553 | -- | |

See footnotes at end of table.

## Table 3.—Peru: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1971[1] | 1972[2] | 1973[3] | Principal destinations, 1973[3] |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Coal | 36 | NA | 21,129 | All to Ireland. |
| Petroleum:[10] | | | | |
| Crude | | | | |
| thousand 42-gallon barrels | 1,265 | 1,074 | 123 | NA. |
| Refinery products: | | | | |
| Distillate fuel oil ____ do ____ | 74 | 161 | 761 | United States 546. |
| Residual fuel oil ____ do ____ | 178 | 793 | 2,394 | United States 975. |
| Lubricants ____ do ____ | 2 | (11) | (11) | NA. |
| Other: | | | | |
| Liquefied petroleum gas do ____ | 23 | 36 | 10 | NA. |
| Unspecified ____ do ____ | 1 | 3 | 6 | NA. |
| Total ____ do ____ | 278 | 993 | 3,171 | |

NA Not available.

[1] Source: Ministerio de Comercio. Estadistica del Comercio Exterior, 1971. Lima, Peru.

[2] Source unless otherwise noted: Statistical Office of the United Nations. Supplement to the World Trade Annual, 1972. V. 2, New York, 1975, pp. 353–357.

[3] Source unless otherwise noted: Statistical Office of the United Nations. World Trade Annual, 1973. V. 1, 2, and 3, New York, 1975.

[4] Source: Sociedad Nacional de Minería y Petróleo. Minero Perú, 1974, Lima, Peru.

[5] Listed distribution is taken from Metallgesellschaft A.G. Metal Statistics, 1964–1974, 62d ed. Frankfort-on-Main, 1975, 348 pp.

[6] Includes ores of vanadium, zirconium, tantalum, and titanium, if any.

[7] Since primary sources (see footnotes 2 and 3) give value only from the United States in this category, the quantity exported to the United States is taken from U.S. official imports.

[8] May include portions of ores and concentrates listed elsewhere in this table.

[9] Partial figure; data represent official U.S. import statistics only.

[10] Source for 1972 and 1973: Ministerio de Energia y Minas, Direccion General de Hidrocarburos. Estadistica Petrolera, 1973. Lima, Peru, pp. 134.

[11] Less than ½ unit.

## Table 4.—Peru: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1971[1] | 1972[2] | 1973[3] | Principal sources, 1973[3] |
|---|---|---|---|---|
| METALS | | | | |
| Aluminum: | | | | |
| Bauxite and concentrate | 600 | NA | NA | |
| Oxide and hydroxide | 2,567 | 1,612 | 2,354 | West Germany 1,702; United States 652. |
| Metal including alloys, all forms: | | | | |
| Scrap | 532 | 725 | 628 | All from United States. |
| Unwrought and semimanufactures | 7,336 | 5,314 | 4,342 | Canada 2,969; United States 309; West Germany 278. |
| Antimony metal including alloys, all forms | 3 | NA | NA | |
| Chromium: | | | | |
| Oxide and hydroxide | 28 | NA | NA | |
| Metal including alloys, all forms | 1 | NA | NA | |
| Copper: | | | | |
| Ore and concentrate | 1,873 | 148 | NA | |
| Matte | 1 | -- | NA | |
| Metal including alloys, all forms | 797 | 530 | 626 | West Germany 239; United States 99; Sweden 66. |
| Gold metal, unworked or partly worked troy ounces | 227 | NA | NA | |
| Iron and steel: | | | | |
| Ore and concentrate | 24 | NA | NA | |
| Metal: | | | | |
| Scrap | 264 | 12,024 | NA | |
| Pig iron, ferroalloys, and similar materials | 1,327 | 769 | 404 | United States 274; West Germany 130. |
| Steel, primary forms | [4]4,662 | 55,060 | 13,175 | United States 12,109. |
| Semimanufactures: | | | | |
| Bars, rods, angles, shapes, sections | [4]23,617 | 46,686 | 58,765 | Japan 38,573; United States 12,691. |

See footnotes at end of table.

## Table 4.—Peru: Imports of selected mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1971[1] | 1972[2] | 1973[3] | Principal sources, 1973[3] |
|---|---|---|---|---|
| METALS—Continued | | | | |
| Iron and steel—Continued | | | | |
| Metal—Continued | | | | |
| Semimanufactures—Continued | | | | |
| Universals, plates, sheets | [4]131,368 | 107,559 | 114,000 | Japan 64,769; Canada 16,781; United States 14,254. |
| Hoop and strip | [4]18,297 | 3,237 | 4,523 | Japan 2,542; United States 1,138. |
| Rails and accessories | [4]1,904 | 1,543 | 843 | All from United States. |
| Wire (excluding wire rod) | [4]3,567 | 4,552 | 4,062 | Japan 2,059; Belgium-Luxembourg 720; West Germany 429. |
| Tubes, pipes, fittings | [4]18,794 | 14,249 | 32,301 | United States 16,438; Japan 13,752. |
| Castings and forgings, rough | [4]1,436 | 3,030 | 845 | United States 808. |
| Lead metal including alloys, all forms | 26 | NA | NA | |
| Magnesium metal including alloys, all forms | 6 | NA | NA | |
| Manganese: | | | | |
| Ore and concentrate | -- | 359 | 376 | All from United States. |
| Oxide | 1,292 | 487 | 414 | All from Japan. |
| Mercury, 76-pound flasks | 12 | NA | NA | |
| Nickel metal including alloys, all forms | 67 | 54 | 37 | All from West Germany. |
| Phosphorus, elemental | 29 | NA | NA | |
| Platinum-group metals and silver: | | | | |
| Ore and concentrate value, thousands | [4]$347 | $391 | NA | |
| Metal including alloys: | | | | |
| Platinum group, troy ounces | 1,281 | (5) | (5) | All from Switzerland. |
| Silver, do | 7,202 | | | |
| Tin metal including alloys, all forms long tons | 305 | 4,565 | NA | |
| Titanium oxide | 1,754 | 142 | 310 | Italy 125; West Germany 99; Belgium-Luxembourg 86. |
| Zinc: | | | | |
| Oxide | 13 | NA | NA | |
| Metal including alloys, all forms | 100 | NA | NA | |
| Other: | | | | |
| Ore and concentrate, n.e.s | 1,921 | 578 | NA | |
| Oxides, hydroxides, and peroxides of metals, n.e.s | 119 | 60 | 562 | NA. |
| Metals including alloys, all forms | 1 | NA | NA | |
| NONMETALS | | | | |
| Abrasives, natural, n.e.s.: | | | | |
| Pumice, emery, natural corundum, etc | 134 | NA | NA | |
| Grinding and polishing wheels and stones | 196 | 71 | 80 | Spain 47; West Germany 33. |
| Asbestos | 8,749 | 7,027 | 7,068 | All from Canada. |
| Barite and witherite | 100 | NA | NA | |
| Boron materials, oxide and acid | 454 | 147 | NA | |
| Cement | 9,410 | 1,057 | 3,211 | West Germany 2,828; Japan 383. |
| Chalk | 1,578 | NA | NA | |
| Clays and clay products (including all refractory brick): | | | | |
| Crude clays, n.e.s.: | | | | |
| Bentonite | 951 | | | |
| Kaolin | 1,944 | 6,737 | 6,190 | United States 4,141; United Kingdom 2,049. |
| Other | 1,447 | | | |
| Products | 2,816 | 3,230 | 3,255 | West Germany 1,048; Italy 977. |
| Diamond, all grades, value, thousands | $564 | $682 | $541 | Belgium-Luxembourg $441; United States $100. |
| Diatomite | 1,722 | NA | NA | |
| Fertilizer materials: | | | | |
| Crude, phosphatic | 15,084 | 8,117 | 15,975 | All from United States. |
| Manufactured: | | | | |
| Nitrogenous | 80,082 | 35,299 | 108,980 | Netherlands 60,142; West 28,870; Belgium-Luxembourg 18,963. |
| Phosphatic | 1,643 | 565 | 3,920 | All from United States. |
| Potassic | 9,433 | 12,232 | 10,944 | United States 7,347; West Germany 3,597. |
| Mixed | 7,821 | 2,175 | 8,028 | All from United States. |

See footnotes at end of table.

## Table 4.—Peru: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1971[1] | 1972[2] | 1973[3] | Principal sources, 1973[3] |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Fluorspar | 199 | 1,111 | 816 | All from Netherlands. |
| Graphite, natural | 29 | NA | NA | |
| Gypsum and plasters | 199 | NA | NA | |
| Magnesite | 2,272 | NA | NA | |
| Mica, all forms | 192 | NA | NA | |
| Pigments, mineral, including processed iron oxides | 684 | 395 | 463 | All from West Germany. |
| Salt | 423 | NA | NA | |
| Sodium and potassium compounds, n.e.s.: | | | | |
| Caustic soda | 9,494 | 4,850 | 3,811 | United States 2,921; West Germany 890. |
| Caustic potash, sodic, potassic peroxides | 98 | NA | NA | |
| Soda ash | -- | 12,720 | NA | |
| Stone, sand and gravel: | | | | |
| Dimension stone, crude and partly worked | 619 | 576 | 871 | All from Italy. |
| Dolomite | (6) | 1,365 | NA | |
| Gravel and crushed rock | 79 | NA | NA | |
| Quartz and quartzite | 66 | | | |
| Sand, excluding metal bearing | 3,945 | 3,222 | 4,674 | All from United States. |
| Sulfur: | | | | |
| Elemental, all forms | 7,528 | NA | NA | |
| Sulfuric acid | (6) | NA | NA | |
| Talc and related materials | 926 | 741 | 365 | All from Italy. |
| Other nonmetals, n.e.s.: | | | | |
| Crude | 4 | [7]2,292 | NA | All from United States. |
| Oxides and hydroxides of strontium, barium, and magnesium | 302 | 133 | 67 | |
| Bromine, iodine, fluorine | 3 | NA | NA | |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 105 | NA | NA | |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Asphalt and bitumen, natural | 81 | 300 | NA | |
| Carbon black and gas carbon | 4,844 | 293 | 190 | All from Japan. |
| Coal, all grades, including briquets | 27,020 | 61,544 | 20,329 | All from United States. |
| Coke and semicoke | 1,370 | 119,539 | 165,922 | Japan 164,714. |
| Petroleum:[8] | | | | |
| Crude and partly refined thousand 42-gallon barrels | 11,762 | 11,953 | 12,920 | NA. |
| Refinery products: | | | | |
| Gasoline: | | | | |
| Aviation do | 279 | 253 | 271 | NA. |
| Motor do | -- | 112 | 111 | NA. |
| Jet fuel do | 159 | 43 | 69 | NA. |
| Distillate fuel oil do | 198 | 18 | 87 | NA. |
| Residual fuel oil do | 1,748 | 1,399 | 1,082 | NA. |
| Lubricants do | 211 | 314 | 276 | NA. |
| Other: | | | | |
| Liquefied petroleum gas do | 26 | 58 | 143 | NA. |
| Naphtha, unfinished do | 1,084 | 285 | 383 | NA. |
| Unspecified do | 59 | 34 | 33 | NA. |
| Total do | 3,764 | 2,511 | 2,455 | |
| Mineral tar and other coal-, petroleum-, or gas derived crude chemicals | 3,417 | (9) | (9) | |

NA Not available.

[1] Source unless otherwise noted: Ministerio de Comercio. Estadistica del Comercio Exterior, 1971. Lima, Peru.

[2] Source unless otherwise noted: Statistical Office of the United Nations. Supplement to the World Trade Annual, 1972. V. 2, New York, 1975, pp. 358–377.

[3] Source unless otherwise noted: Statistical Office of the United Nations. World Trade Annual, 1973. Vs. 1–3, New York, 1975.

[4] Source: Statistical Office of the United Nations. Supplement to the World Trade Annual, 1971. V. 2, New York, 1974, pp. 348–356.

[5] Value only reported at U.S. $87,000 for 1972 and $175,000 for 1973.

[6] Less than ½ unit.

[7] Excludes amount valued at US$150,000.

[8] Source: Ministerio de Energia y Minas, Direccíon General de Hidrocarburos. Estadistica Petrolera, 1973. Lima, Peru, pp. 134.

[9] Value only reported at U.S. $124,000 for 1972 and $122.000 for 1973. Principal sources for 1973 were the United States $69,000 and the United Kingdom $53,000.

## COMMODITY REVIEW

### METALS

**Copper.**—Minero Perú announced plans to expand copper output to 1.1 million tons per year by 1980. In addition to Toquepala and other sources now producing, and Cuajone and Cerro Verde, which are being prepared to operate, another eight porphyry copper deposits will contribute to the total; these are Tintaya, Santa Roso, Chalcobamba, Ferrobamba, Antamina, Quellaveco, Michiquillay, and Toromocho.

At the end of November it was announced that four members of the Conseil Intergouvernemental des Pays Exportateur de Cuivre (CIPEC) would reduce annual production by 224,500 tons. Peru's share of the total was to be 9,500 tons.

At the beginning of the year, Southern Peru Copper Corp. (SPCC) was owned by American Smelting and Refining Co. (51.5%), Cerro Corp. (22.25%), Phelps Dodge Corp. (16%), and Newmont Mining Corp. (10.25%.

SPCC geologists have defined a body of ground water underlying the boundary between Moquegua and Tacna. The quantity was considered ample to supply all requirements at the Cuajone mine. Reenforced plastic pipe to carry the water and also mill tailings was being fabricated on the site; an estimated 56 miles of pipe will be needed. Nineteen miles of new railroad, 17 of them in tunnels, were under construction, to connect Cuajone to the line between Toquepala and the smelter at Ilo. Overburden was being stripped from the mine site at the rate of 130,000 tons per day.

In September a group of Japanese firms invested $24 million in Cuajone. A further agreement was made to earmark 30,000 tons of blister copper per year for purchase by Japanese consumers over a 15-year period beginning in 1978.

Cerro Verde is an oxide deposit located directly above the Santa Rosa sulfide body, in the State of Arequipa. Development of Cerro Verde is of highest priority to Minero Perú, but initial output has been deferred until Santa Rosa has been thoroughly drilled; the sulfide body was discovered to be much larger than originally assumed. Cerro Verde's reserves are estimated at 67 million tons at an average grade of 0.673% copper. Reserves at Santa Rosa are now estimated at 1,172 million tons at an average grade of 0.545% copper. Production at the rate of 30,000 tons per year of copper was rescheduled to begin in 1977; an electrowinning process will be used.

Negotiations with Placer Development, Ltd., for design and installation of the Cerro Verde plant were broken off, and arrangements were made instead, about midyear, with Dowa Mining Co. Ltd. and Marubeni Corp. The two Japanese companies were to conduct a feasibility study, not only on production from Cerro Verde and Santa Rosa, but also from the Tintaya deposit, and perhaps including processing of phosphate at Bayovar, using sulfuric acid generated from the Santa Rosa sulfides.

Mitsui Mining & Smelting Co. Ltd. and Furukawa Mining Co., Ltd. continued construction of the refinery at Ilo; the scale of intended operations was increased from 150,000 to 225,000 tons per year, with eventual expansion to 300,000 tons per year.

Minero Perú and CENTROMIN began small-scale development of the deposit at Toromocho, where reserves are estimated at 200 million tons at an averaging grade of 0.78% copper. This pilot operation is expected to yield the engineering data required for mining and concentration. CENTROMIN will simultaneously drill the deposit; almost 150,000 feet of hole will be core-drilled to measure reserves more accurately and to determine the ultimate location of pit and concentrator.

In November final approval was given for the contract between Minero Perú and Michiquillay Copper Corp. of Japan for a feasibility study of the Michiquillay deposit. Completon of the study was expected about mid-1975, and the decision as to a major undertaking will be made at yearend 1975.

Cia. Minera del Madrigal, a Homestake Mining Co. subsidiary, was producing 600 tons per day of oxide ore. Concentrates were being shipped to various smelters in Japan at yearly rates of 10,000 tons of 30% copper content, 18,000 tons of 60% zinc content, and 6,500 tons of 65% lead content. Volume is expected to double by 1976.

SPCC's Toquepala mine contributed 55% of Peru's copper output in 1974. The mine's production, in terms of blister copper, reached 121,935 tons. Northern Peru Mining Co.'s Quiruvilca mine produced

6,700 tons of copper, some lead and zinc, and 1.39 million troy ounces of silver.

The Peruvian Government has been offered, as a gift, the Condestable mine, in the Department of Lima about 100 kilometers south of the capital. The mine was opened in 1963 by Cia. Minera Condestable, S.A., a subsidiary of Nippon Mining Co., Ltd., and has already paid back the initial investment. About 750,000 tons of 2% copper ore remains to be mined.

Discovery of a large copper deposit at Cañariaco, in northern Peru, was announced late in December 1973. The deposit, in the Department of Piúra, was estimated to contain 330 million tons of ore at grades between 0.45% and 0.80% copper.

Mitsui Mining & Smelting Co. drilled an area in the Department of Cuzco in which reserves of 60 million tons of ore at an average grade of 0.6% copper were present. Mitsui was granted mining rights by the Peruvian Government as a result. Japanese interests also sought an agreement with the Government to evaluate the porphyry copper deposits of Corohuayco and Huacollo, both in Cuzco.

**Gold.**—Production of gold in 1974 increased substantially over the 1973 output. About half of Peru's annual production was a byproduct of the operations of CENTROMIN. The remainder came from two gold mines in the Department of Puno and from many small operations in the jungle areas of Puno, Cuzco, and Madre de Dios. In the jungle areas, gold was found in both the fine gravels and sands of the lower elevations, and in the coarser gravels characteristic of the higher elevations. In both areas, lack of transportation facilities inhibited expanded production, and not enough was known about the region's gold reserve to warrant road construction.

Nevertheless, the Banco Minero sold 21,000 troy ounces of gold to Canada for $3.5 million in May.

**Iron Ore.**—Early in the year a shortage of residual fuel oil caused Marcona Mining Co. to suspend shipments of iron ore, and later to require their fleet of ore carriers to reduce ocean speed by 25%. At about the same time, Marcona, Mitsui Mining Co., and Marubeni Corp. found it expedient to review their agreement to build an additional 3.5 million-ton-per-year pelletizing plant. The oil shortage did not affect mine output, which was 6% greater than in 1973.

Feasibility studies on two iron deposits were undertaken by Canadian Minerals and Resources. Minero Perú contracted for one such study on a deposit near Acari, and Apurimac Mining Co. bought a similar study on their deposits further inland.

**Iron and Steel.**—Plans for expansion of the national steel works at Chimbote, 250 miles north of Lima, became more definite at yearend. Already underway was a project to increase yearly output from 425,000 to 700,000 tons of raw steel by late 1975. Further expansion to increase capacity to 2,350,000 tons by 1981 was planned. To accomplish this, two blast furnaces, each of 940,000-ton-per-year capacity, will be built to supply a new basic-oxygen steel plant of ultimate 1.6-million-ton-per-year capacity. The present basic oxygen plant will be expanded to 600,000-ton-per-year capacity. Continuous casting facilities will be installed to handle most of the raw steel output. A hot rolling mill, a cold rolling mill, and a plate shop will be added. A coking plant was scheduled to produce 1.3 million tons of coke per year. Limestone furnaces and an oxygen-producing facility will be built. Finally, port facilities at Caleta will be expanded.

Feasibility studies of a possible steel plant at Nazca, Department of Ica, were in progress during the year. SIDERPERU, the Government steel monopoly, also was planning to erect about 100,000 tons of sponge iron capacity to replace scrap, now imported and sometimes unobtainable.

**Zinc.**—Minero Perú asked for bids on construction of a 100,000-ton-per-year zinc refinery. A Belgian company, Sybetra, was selected; contracts have been signed and are awaiting government approval. The cost was estimated at $170 million. The plant will also produce yearly 335 tons of cadmium, 1,630 tons of cement copper, and 176,000 tons of sulfuric acid. Financing was being sought.

## NONMETALS

**Fertilizer Materials.**—In the Sechura desert, in the southern part of the Department of Piúra in northern Peru, is a phosphate deposit with reserves estimated at 38 billion tons of 30% phosphorus pentoxide ($P_2O_5$) content. Minero Perú was given the responsibility of planning and building a mining and processing complex. Kaiser Aluminum & Chemical Corp. had relinquished its option on the deposit after extensive exploration. Minero Perú began feasibility studies this year, leading to eventual production of

2 million tons of phosphate concentrate. The first experimental shipment was made in May. Initial production was to be 3,000 tons per day.

A large new deposit of phosphate rock was discovered in the Department of Ica; estimates of tonnage were not available.

A plant was under construction in Talara to produce 300 tons of ammonia per day. Based on the local natural gas, the plant will be operated by Petroperú.

In October, Decree-Law 20194 established a State corporation, Fertiperú, whose responsibilities included production, marketing, and trade in fertilizers, and technologcal development of the industry.

## MINERAL FUELS

**Coal.**—The feasibility study of anthracite coal production in the Alto Chicama Valley, conducted by the Polish governmental company KOPEX, was completed. An estimated 50 million tons was available. The KOPEX company was continuing a similar study in the Oyon Valley.

**Petroleum.**—No further service contracts, of the sort concluded between Petroperú and 18 oil companies in the 3 previous years, were written in 1974. Petroperú was working on a new format, giving Peru a 60% share of production.

Production of crude oil in 1974 was 50% from offshore wells, 47% from wells in the northwestern coastal area, and 3% from the jungle. Total production was 9.6% greater than in 1973.

In April official sources announced that Peru would explore the possibility of joining the Organization of Petroleum Exporting Countries (OPEC), since Peru expects to be a net exporter by 1976.

Exploratory wells drilled during the year on the eastern slope are as follows:

| Company | Total wells | Producing wells | Maximum depth (feet) | Yield (barrels per day) |
|---|---|---|---|---|
| Petroperú | 11 | [1]10 | 14,514 | 31,562 |
| Occidental Petroleum Co | 9 | 8 | 13,034 | 27,156 |
| Arco Peru Co | 2 | -- | 13,806 | -- |
| British Petroleum Co | 3 | -- | 14,709 | -- |
| Amoco Peru Petroleum Co | 2 | 1 | 12,300 | 807 |
| Getty Oil (Peru) | 1 | -- | 16,768 | -- |
| Phillips Petroleum Co | 1 | -- | 17,034 | -- |
| Peruvian Sun Oil Co | 1 | -- | 16,799 | -- |
| Union Oil Co | 3 | [2]2 | 12,780 | 859 |

[1] Includes eight confirmatory wells and one well abandoned because of mechanical problems.
[2] Low-gravity crude (API 10.5 to 11).

Oceanic Exploration Co., Amerada Hess Corp. of Peru, Dominex, Petroperú, Signal Petroleum Co. of Peru, Hispanoil, Total-Peru, Andes Petroleum Co., and Peru Cities Service Corp. continued seismic programs during the year.

Occidental del Peru Petroleum Co. received authorization from the Peruvian Government to ship 10,000 barrels per day to Iquitos for export to Manaos, Brazil. Occidental accordingly built 47 kilometers of 10-inch pipeline from Shiviyacu to the Tigre River, where barges will carry the crude oil to Iquitos.

Petroperú drilled 82 wells, totaling 450,000 feet, along the northwest coastal areas. Of these, 74 were development wells and 8 were exploratory; 75% of each type were producers. Two secondary recovery projects began at Verdum Alto and Ancha.

Tenneco Corp. returned to its offshore exploration program after a year of data reevaluation. Two wells were drilled and found barren; a third was begun.

Belco Petroleum Corp. del Perú drilled 6 exploratory wells, 3 being producers, and 38 development wells, of which 27 were producers and 3 were being evaluated.

In January contracts for 146,000 tons of 36-inch pipe were concluded between Indústria Peruana de Alambre, S.A. (ALAMBRESA), and Pipeline Joint Venture Hoesch-Salzgitter of West Germany. In May similar contracts for 24-inch pipe were reported concluded between ALAMBRESA and an unnamed Japanese company. The pipeline, 531 miles in length, will extend from San José de Saramuro, Department of Loreto, westward up the Marañon River, crossing the Continental Divide at 2,400 meters through Porculla Pass, and thence to the marine terminal to be built at Bayovar. Initial throughput is to be 200,000 barrels per day. Additional

pumping power can raise this to a maximum figure of 500,000 barrels per day.

A loan of $330 million for the pipeline ($230 million) and jungle oil exploration ($100 million), made by the Japan Petroleum Development Corp. and the Japan Peru Oil Co., was approved by both governments early in May.

Refinery throughput in 1974 was 108,700 barrels per day, for a total product production of 39.69 million barrels. Refined product output by plant, was as follows, in thousand 42-gallon barrels:

| | Motor gasoline | | Kerosine | | Diesel | | Residual fuel | | Other | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1973 | 1974 | 1973 | 1974 | 1973 | 1974 | 1973 | 1974 | 1973 | 1974 |
| Talara | 7,144 | 7,054 | 3,837 | 4,020 | 5,184 | 4,957 | 6,039 | 7,264 | 928 | 1,010 |
| La Pampilla | 3,963 | 4,111 | 194 | 70 | 1,255 | 1,526 | 3,606 | 3,895 | 1,944 | 2,024 |
| Jose L. Diaz | 40 | 73 | 96 | 165 | 157 | 141 | 105 | 104 | [1]1 | 1 |
| Conchan-Chevron | r 555 | 410 | 331 | 354 | 456 | 561 | 1,115 | 1,298 | 179 | 154 |
| Ganso Azul | 42 | 64 | 36 | 48 | 72 | 139 | 58 | 201 | [1]4 | [1]4 |

r Revised.
[1] Processing gain.
Source: U.S. Embassy, Lima, Peru, State Department Airgram A-60, Apr. 18, 1975.

At yearend, the Ganso Azul refinery at Pucallpa was receiving 2,000 barrels per day from Petroperú Corrientes wells and some crude from the Maquia Field, while the J. L. Diaz refinery at Iquitos was shut down for inspection and maintenance.

A new catalytic cracker went on-stream at Talara in December to increase the refinery's gasoline output. At La Pampilla, Cie. Française d'Etudes et de Construction contracted to build a 65,000-barrel-per-day primary distillation unit and supporting facilities.

Just north of the Talara refinery, a nitrogenous fertilizer plant was nearing completion at yearend. It was built by Toyo Construction Co. Ltd. and is expected to produce 300 tons per year of liquid ammonia, 510 tons per year of urea, and some carbon dioxide.

In June, construction of a carbon-black plant of 7,700-ton annual capacity began. The plant, also in the Talara area, was being built by Technología y Procesos Industriales, S.A., and Ingeniería Panamericana, S.A., and was expected on-stream in the last half of 1975.

A contract with Lurgi Mineraltechnik GmbH was concluded in August, providing for construction of a solvents plant to produce acetone and isopropyl alcohol.

# The Mineral Industry of the Philippines

By Richard H. Singleton [1]

In 1974 Philippine mineral production increased 33% to a record value of $706 million,[2] and represented 5% of the gross national product (GNP). Real mineral production, based on 1973 prices, increased only 1%. Ores and concentrates containing copper, gold, iron, chromium, silver, and zinc comprised 74% of mineral production value and were smelted overseas. Copper continued to dominate the mineral industry, providing more than one-half of mineral output value. Installation of domestic smelter capacity was frustrated by lack of energy and capital. The country was entirely dependent on foreign oil for energy except for some coal and hydroelectric sources. The 1974 expenditures for oil totaled $650 million.

Copper production increased 1% in 1974 but expansion was impeded at yearend by high production costs and low world prices. The country produced 3% of the world's copper. Production of cement, the second most valuable mineral commodity, decreased 14% due to a government export ban early in the year to conserve oil. Iron ore production decreased 29% due to high production costs and lack of demand overseas. Chromium ore and concentrate production decreased 9% but the country supplied 8% of the world's chromium raw materials. Gold and silver production decreased 6% and 10%, respectively. The Philippines produced 1% of the world's gold. Zinc production increased 45%.

A new nickel mine and refinery came onstream late in the year, increasing nickel metal capacity to 5% of the world production. Plans for other nickel facilities were finalized. The Government stated that nickel would likely surpass copper as the leading domestic mineral commodity.

An agreement to build a 100,000- to 200,000-ton-per-year aluminum smelter was signed. The agreement was contingent on development of a geothermal energy source. An agreement to develop domestic bauxite resources was signed.

Fertilizer production increased 38% but 85% of demand was still met by importation.

The Philippine economy performed surprisingly well in 1974 in spite of the oil crisis, worldwide inflation, and falling export demand due to recessions in major markets. GNP, at $13.8 billion, showed a real growth of 5.9% compared with 9.9% in 1973. The volume of oil imports decreased by 2%, but oil import costs increased by a factor of 3.5. Substantial drops in export prices for copper concentrate, coconut oil, and timber were offset by record export prices for sugar. Export returns rose 48% to $2,725 million, but imports nearly doubled to $3,143 million for a 1974 trade deficit of $418 million. Oil comprised 21% of imports. Thanks to inflows of $528 million in nonmerchandise (mainly tourist receipts and transfer payments) and capital accounts (borrowings and net foreign investments), the 1974 balance of payments ended with a surplus of $80 million, and gross international reserves rose to $1.6 billion, up 33% from 1973.

Consumer and wholesale prices for all

[1] Physical scientist, Division of Nonmetallic Minerals.

[2] Where necessary, values have been converted from Philippine pesos (₱) to U.S. dollars at the rate of ₱6.85=US$1.00.

goods increased 34% and 55%, respectively, in 1974. Average mineral prices increased 32%. The exchange rate of the Philippine peso (P) with the U.S. dollar increased 5%, to P7.07=US$1.00 by year-end.

The Philippine Government began a 12-year program to reduce oil imports by exploring for domestic oil and by development of geothermal, coal, hydroelectric, and nuclear energy resources. Most of the contemplated smelters were determined to be dependent on the availability of nearby energy sources. A contract was signed in May with Burns & Roe, Inc. (United States) for the initial phase of a nuclear installation scheduled for initial operation in 1983. National Power Corp. stated that a geothermal energy source found in Makiling in Laguna (steam temperature 570° F) appeared more promising than the one at Tiwi, Albay (steam temperature 520° F). The Albay governor revealed plans in December to develop a 1,000-megawatt power source. A huge waterfall discovered on Negros Island reportedly may determine the location of a copper smelter because of its hydroelectric power potential. The Pantabangan dam, largest in the Philippines, was inaugurated in 1974, primarily for irrigation and flood control but a 100-megawatt generating capacity was planned. Oil well drilling was encouraged by the Government, particularly offshore. Encouraging traces were found in the Sulu Sea but all domestic wells drilled to date have been dry.

Foreign investment in natural resources development was encouraged and domestic mineral production was encouraged through a mineral depletion allowance. Total foreign investment was determined to be $1.4 billion, 70% of which was by the United States. Japanese and European investment was actively pursued, particularly in nickel and copper smelting but also in iron and steel, fertilizer, pulp and paper production, and shipbuilding. A presidential directive was proposed late in 1974 to reduce maximum foreign equity on mining investment to 30% from the current 40%, in corporations exploiting natural resources.

Expiration of the Laurel-Langley Agreement in July, which gave U.S. citizens preferential rights in the Philippines, had no perceptible effect on the continued development of commercial and economic relations with the United States.

The mineral depletion allowance was reduced from 50% to 25% in 1974. The flat export duty of 4% to 6% which had been imposed late in 1973 on most mineral commodities was supplemented in 1974 by a 20% to 30% export tax on value above an established commodity price. At year-end, the mineral industry was asking for relief from the 6% and 4% export taxes on copper concentrate and bunker fuel oil, respectively, and an increase in the mineral depletion allowance back to 50%.

In their review of the 1974 Philippine economy, the U.S. Embassy in Manila stated that the economy of the Philippines has good prospects in meeting its 5% future annual growth target and that the potential for U.S. investment and exports remains attractive.

## PRODUCTION

Mineral production value, excluding petroleum products, increased 33%, to $706 million, but the increase was only 1% in terms of 1973 prices. Approximately 74% of this mineral value was shipped as ore or concentrate to foreign countries, primarily Japan, for smelting. Copper dominated with 58% of mineral production value followed by gold at 11%, iron at 1.7%, chromium at 1.6%, silver at 0.9%, and zinc at 0.4%. Portland cement dominated nonmetallic mineral production, accounting for 15% of the country's total mineral output value, and was second to copper. Other nonmetallic minerals of major importance were fertilizers at 2%, clays at 1.2%, salt at 0.9%, gypsum at 0.7%, and lime plus marble at 0.3%. Value of coal production equaled 0.2% of mineral production.

## Table 1.—Philippines: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **METALS** | | | |
| Cadmium mine output, metal content—kilograms | 7,983 | -- | -- |
| Chromite, gross weight: | | | |
| Metallurgical grade | 81,370 | 95,659 | 100,415 |
| Refractory grade | 268,230 | 484,609 | 429,132 |
| Total | 349,600 | 580,268 | 529,547 |
| Copper mine output, metal content | 213,695 | 221,195 | 224,400 |
| Gold—troy ounces | 606,730 | 572,319 | 536,399 |
| Iron and steel: | | | |
| Iron ore and concentrate—thousand tons | 2,205 | 2,255 | 1,608 |
| Ferroalloys | 1,819 | 1,960 | 2,212 |
| Lead mine output, metal content | -- | -- | 1,308 |
| Manganese ore and concentrate, gross weight | 2,491 | 3,973 | 857 |
| Mercury mine output, metal content—76 pound flasks | 3,341 | 2,160 | 812 |
| Nickel mine output, metal content | 384 | 399 | 326 |
| Platinum-group metals: | | | |
| Palladium—troy ounces | 4,810 | 4,205 | 2,315 |
| Platinum—do | 2,712 | 2,464 | 1,350 |
| Silver mine output, metal content—thousand troy ounces | 1,848 | 1,892 | 1,706 |
| Zinc mine ouput, metal content | 4,603 | 5,371 | 7,772 |
| **NONMETALS** | | | |
| Barite | -- | 3,261 | e 3,300 |
| Cement, hydraulic—thousand tons | 2,903 | 4,059 | 3,503 |
| Clays: | | | |
| Bentonite | 61 | -- | -- |
| Red | 8,541 | 13,411 | |
| White | 11,655 | 18,676 | |
| Rock | 4,202 | 3,245 | NA |
| Other | 280,482 | 220,886 | |
| Feldspar | 46,061 | 24,998 | 10,245 |
| Fertilizer materials: | | | |
| Crude phosphatic: | | | |
| Guano | 2,012 | 10 | 13,552 |
| Phosphate rock | 2,618 | 12,228 | 26,506 |
| Manufactured: | | | |
| Nitrogenous e 1 | r 58,600 | 55,400 | 52,800 |
| Mixed unspecified | 56,975 | 56,896 | 79,126 |
| Gypsum and anhydrite, crude 2 | r 84,945 | 101,782 | 126,126 |
| Lime | 282,665 | 151,488 | 101,262 |
| Perlite | 435 | 825 | 1,131 |
| Pyrite and pyrrhotite (including cupreous): | | | |
| Gross weight | r 199,494 | 203,601 | 253,000 |
| Sulfur content | r 92,765 | 94,674 | 117,000 |
| Salt, marine | 219,500 | 220,000 | 213,644 |
| Sand and gravel: | | | |
| Sand, glass—thousand tons | 412 | 505 | 689 |
| Sand and gravel, n.e.s. 3—thousand cubic meters | r 5,599 | 5,691 | NA |
| Stone: | | | |
| Coral, crushed—thousand cubic meters | 334 | 332 | NA |
| Dolomite | 8,871 | 10,455 | 11,677 |
| Limestone—thousand tons | 4,015 | 4,534 | 6,588 |
| Marble (dimension) unfinished | r 4,102 | 9,053 | 6,529 |
| Tuff | 49,387 | 38,667 | 59,296 |
| Cobbles and boulders, n.e.s.—thousand cubic meters | 216 | 216 | NA |
| Sulfur, elemental | 10 | -- | -- |
| Talc | 1,007 | 1,634 | 1,676 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Coal, all grades | 38,900 | 39,004 | 50,746 |
| Petroleum refinery products: | | | |
| Gasoline—thousand 42-gallon barrels | 16,004 | 16,477 | |
| Jet fuel—do | 2,589 | 2,033 | |
| Kerosine—do | 3,601 | 3,351 | |
| Distillate fuel oil—do | 13,663 | 12,432 | NA |
| Residual fuel oil—do | 21,562 | 24,286 | |
| Other—do | 2,549 | 3,046 | |
| Refinery fuel and losses—do | 4,153 | 4,066 | |
| Total—do | 64,121 | 65,691 | NA |

e Estimate. p Preliminary. r Revised. NA Not available.

1 Data are for year ending June 30 of that stated.

2 Includes synthetic.

3 Includes unspecified earths.

## TRADE

Value of mineral exports during 1974 increased 20% to an estimated $510 million. However, the value increase based on 1973 prices was less than 1%. Nearly three-quarters of the produced mineral value was exported, mostly as ore and concentrate, mainly to Japan, 70%, with 7% going to the United States. Copper ore and concentrate accounted for 75% of mineral export value, with 85% of copper exports going to Japan. Copper exports were 33% lower in the second half of the year than in the first, primarily because of the depressed Japanese market. Other major exports were gold, cement, chromite, iron ore, silver, and zinc, most of which went to Japan, except for cement and chromium. The United States and Japan received nearly equal amounts of Philippine chromite ore and concentrate, as the major importers of this commodity from the Philippines. Minor exports were nickel ore, marble, mercury, platinum and palladium, iron pyrites, and manganese ore. Japan received most of each of these materials in 1973 except the manganese ore went to Taiwan.

Value of total exports during 1974 increased 48%, to $2,725 million. Copper ore and concentrate was the second most valuable commodity exported, accounting for 16% of the total. The No. 1 exported commodity was sugar at 26%. Value of total imports in 1974 increased 97%, to $3,143 million, with petroleum accounting for 21% of the total. Imports were 18% higher during the second half than in the first, mostly because of increased costs of petroleum procurement due to unit price increases. The 1974 trade deficit was $418 million. It rose from $128 million during the first half to $293 million during the second half. This increase was also caused primarily by increased oil importation costs during the second half. The large 1974 trade deficit with the Organization of Petroleum Exporting Countries (OPEC), Nations, $565 million, was partially offset by the large surplus with the United States, $421 million. A trade surplus of $24 million (revised) had been realized in 1973.

The United States was the Philippines No. 1 trading partner during 1974, with Japan a very close second. The two countries accounted for 63% of 1974 trade. Japan was the leading 1974 exporter to the Philippines, although the latter enjoyed a trade surplus with Japan of $85 million. Trade with Europe equaled 12% of total trade. Trade with countries with controlled economies was less than 2% of the total. Trade with the People's Republic of China (PRC) began with the arrival in the Philippines in October of a shipment of petroleum. Trade missions were made to the Soviet Union during the year. The text of a new trade agreement with Australia was approved in November. Increased trade with Canada was encouraged.

**Table 2.—Philippines: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, all forms | 1,299 | 2,803 | Hong Kong 995; Japan 994; Singapore 426. |
| Chromium, chromite ore and concentrate | 382,807 | 598,153 | United States 250,511; Japan 195,915; United Kingdom 41,277. |
| Copper: | | | |
| Ore and concentrate | 780,438 | 783,803 | Japan 692,004; United States 46,731; West Germany 23,610. |
| Metal including alloys: | | | |
| Scrap | 3,366 | 2,520 | Japan 1,328; Spain 452; United Kingdom 341. |
| Matte | 7 | 8 | All to Switzerland. |
| Unwrought and semimanufactures | r 5 | (1) | |
| Gold: | | | |
| Bullion thousand troy ounces | 180 | 182 | All to United Kingdom. |
| Metal, rolled, unworked or partly worked do | -- | 293 | Japan 194; United States 75; Republic of Korea 15. |

See footnotes at end of table.

## Table 2.—Philippines: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel: | | | |
| Ore and concentrate thousand tons | 2,227 | 1,966 | Japan 1,961; Taiwan 5. |
| Roasted pyrite ---- do | 29 | 43 | Japan 32; Taiwan 6; Republic of Korea 5. |
| Metal, semimanufactures: | | | |
| Bars, rods, angles, shapes, and sections | 139 | 1,848 | Indonesia 1,190; Hong Kong 500; Guam 157. |
| Universals, plates and sheets | 2,481 | 177 | United States 128; Indonesia 27; Guam 5. |
| Wire | -- | 7 | All to Guam. |
| Tubes, pipes, and fittings | 1,395 | 952 | Guam 901. |
| Castings and forgings | -- | 22 | Guam 12; Australia 10. |
| Lead metal including alloys, unwrought and semimanufactures -- kilograms | -- | 140 | All to Indonesia. |
| Manganese ore and concentrate | 3,965 | 2,464 | All to Taiwan. |
| Mercury ---- 76-pound flasks | 2,914 | 1,314 | Japan 979; Australia 200; United States 135. |
| Nickel: | | | |
| Ore and concentrate | 2,513 | 2,841 | All to Japan. |
| Metal, waste and scrap | -- | 70 | Do. |
| Silver metal including alloys, unworked and partly worked: | | | |
| Silver, including silver gilt and platinum plated silver thousand troy ounces | 950 | 290 | Japan 238; United Kingdom 45; Hong Kong 7. |
| Rolled ---- do | 4 | 151 | Hong Kong 91; Japan 52; United Kingdom 8. |
| Titanium oxide and hydroxide | -- | 5 | All to Singapore. |
| Zinc: | | | |
| Ore and concentrate | 8,708 | 10,652 | All to Japan. |
| Oxides and peroxides | -- | 20 | Do. |
| Metal including alloys: | | | |
| Scrap | 1,102 | 1,098 | Japan 633; Taiwan 465. |
| Unwrought, ingots, slabs and pigs | -- | 50 | All to Singapore. |
| Other: | | | |
| Ores and concentrates, n.e.s.: | | | |
| Copper, gold and silver concentrates | 5,487 | -- | |
| Lead and copper concentrates containing gold and silver | 13,716 | -- | |
| Other | r 45,906 | 3,861 | United States 3,063; Japan 795. |
| Ash and residue containing nonferrous metals | r 55 | 343 | Japan 220; Taiwan 90; United Kingdom 21. |
| Base metals including alloys, all forms, n.e.s | 10 | (2) | Mainly to United States and Japan. |
| NONMETALS | | | |
| Cement, hydraulic | 519,386 | 988,653 | Indonesia 397,853; Singapore 136,158; South Vietnam 122,550. |
| Chalk | 50 | 120 | All to South Vietnam. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s ---- kilograms | -- | 884 | Singapore 518; Thailand 366. |
| Products: | | | |
| Refractory (including nonclay bricks) -- value, thousands | $3 | $3 | All to Republic of Korea. |
| Nonrefractory ---- do | $1,881 | $3,960 | United States $1,287; Hong Kong $973; Singapore $956. |
| Diamond, industrial ---- carats | -- | 3,000 | All to United Kingdom. |
| Feldspar and fluorspar | 50 | 50 | All to Singapore. |
| Fertilizer materials: | | | |
| Manufactured: | | | |
| Mixed | -- | 9,500 | All to South Vietnam. |
| Other, n.e.s | -- | 10 | Mainly to Japan. |
| Ammonia | -- | 28 | All to Hong Kong. |
| Lime | 13 | -- | |
| Pigments, mineral, natural, crude ---- kilograms | -- | 114 | All to Japan. |
| Salt | r 153 | -- | |
| Sodium carbonate (soda ash) | -- | 100 | All to South Vietnam. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Marble | 17 | 20 | All to Guam. |
| Other | 66 | 185 | Japan 146; Guam 34; Hong Kong 5. |

See footnotes at end of table.

## Table 2.—Philippines: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel—Continued | | | |
| Dimension stone—Continued | | | |
| Worked: | | | |
| Marble | 1,845 | 897 | Japan 615; Australia 143; Singapore 41. |
| Other | 6 | 4 | All to Guam. |
| Gravel and crushed stone | 10 | 70 | Hong Kong 57; Guam 13. |
| Quartz and quartzite | -- | 3,600 | All to Japan. |
| Sand: | | | |
| Natural (river and sea) | 138 | 265 | Japan 73; Netherlands 71; United Kingdom 30. |
| Silica | -- | 99 | All to Guam. |
| Other | 15 | 3 | All to Italy. |
| Sulfur, elemental, all forms | 6 | 8,251 | Japan 8,246; Guam 5. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 167 | 332 | Thailand 331. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 1,382 | 3,746 | Indonesia 3,327; Netherlands 222; Hong Kong 141. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | 16 | 207 | Thailand 136; Indonesia 45; Taiwan 26. |
| Gas, manufactured | [3] 6,452 | -- | |
| Petroleum refinery products: | | | |
| Gasoline: | | | |
| Aviation thousand 42-gallon barrels | -- | 1 | Mainly to United States. |
| Motor (includes motor spirits) do | 115 | 270 | Guam 137; United States Trust Territory of the Pacific Islands 63; United States 62. |
| Kerosine do | 52 | 457 | United States 312; Japan 57; Sweden 19. |
| Jet fuel do | 566 | | |
| Distillate fuel oil do | 1,568 | 1,828 | United States 1,058; United Kingdom 388; United States Trust Territory of the Pacific Islands 63. |
| Residual fuel oil do | 563 | 322 | Liberia 97; United Kingdom 47; United States 44. |
| Lubricating oil (includes grease) do | 15 | 43 | Denmark 15; United States 4; Taiwan 3. |
| Other: | | | |
| Asphalt do | 39 | 23 | Guam 20; United States Trust Territory of the Pacific Islands 3. |
| Petroleum pitch and coke do | 477 | 164 | All to Japan. |
| Naphtha do | 6 | 39 | Mainly to Hong Kong. |
| Liquefied petroleum gas do | ([4]) | 233 | Hong Kong 162; United States Trust Territory of the Pacific Islands 54; Guam 8. |
| Total do | [r] 3,401 | 3,380 | |

[r] Revised.
[1] Included in other nonferrous base metals.
[2] Less than ½ unit.
[3] Includes liquefied petroleum gas.
[4] Included in manufactured gas.

## Table 3.—Philippines: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite ore and concentrate | 3,301 | 39 | Malaysia 25; United States 14. |
| Metal including alloys: | | | |
| Scrap | 30 | 127 | Canada 106; United States 21. |
| Unwrought | 11,429 | 15,259 | United States 9,114; Australia 2,835; France 917. |
| Semimanufactures | 1,259 | 1,798 | United States 767; Japan 539; Taiwan 160. |

## Table 3.—Philippines: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Arsenic trioxide, pentoxide and acids | 159 | 176 | France 124; Sweden 24, West Germany 15. |
| Beryllium metal including alloys, wrought ---- kilograms | 27 | -- | |
| Chromium oxide and hydroxide | 89 | 120 | West Germany 58; France 35; United States 21. |
| Cobalt oxide and hydroxide | 15 | 3 | United States 2. |
| Copper: | | | |
| Ore and concentrate | -- | 3,000 | All from Malaysia. |
| Copper sulfate | 33 | 10 | Mozambique 5; West Germany 5. |
| Metal including alloys: | | | |
| Scrap | -- | 56 | All from Japan. |
| Unwrought | 3,271 | 3,376 | Japan 2,002; United States 1,372. |
| Semimanufactures | 2,216 | 2,350 | Japan 853; United States 789; Australia 459. |
| Gold leaf and gold foil ---- troy ounces | 1 | 397 | All from West Germany. |
| Iron and steel metal: | | | |
| Scrap | 44,607 | 4,314 | Australia 3,500; West Germany 400; United States 312. |
| Pig iron, cast iron, powder and shot | 32,986 | 22,550 | Australia 13,887; United States 7,034; Japan 1,447. |
| Ferroalloys | 3,856 | 5,143 | Japan 1,498; Norway 1,210; India 954. |
| Steel, primary forms | 253,751 | 222,123 | Japan 121,301; Australia 89,263; United States 4,302. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, and sections | r 36,757 | 40,201 | Japan 25,178; United States 4,580; Australia 4,367. |
| Universals, plates, and sheets | 538,564 | 302,150 | Japan 280,641; Australia 10,781; United States 10,614. |
| Hoop and strip | 22,391 | 20,915 | Japan 19,038; Taiwan 748; West Germany 163. |
| Rails and accessories | 1,070 | 1,278 | Japan 604; Australia 342; Luxembourg 198. |
| Wire | 8,524 | 12,844 | Japan 11,155; United Kingdom 566; United States 235. |
| Tubes, pipes, and fittings | 30,000 | 27,388 | Japan 24,903; United States 1,162; United Kingdom 457. |
| Castings and forgings | 614 | 3 | Austria 2; United States 1. |
| Lead: | | | |
| Oxides | r 45 | 41 | United States 20; Australia 16; Canada 2. |
| Metal including alloys, all forms | 5,858 | 5,267 | Australia 4,931; United States 196. |
| Magnesium metal including alloys, all forms | 4 | 4 | United States 3. |
| Manganese: | | | |
| Ore and concentrate | 5 | 2,433 | Ghana 2,071; Singapore 180; Australia 179. |
| Oxide and dioxide | 908 | 1,102 | Japan 664; Singapore 180; India 98. |
| Mercury ---- 76-pound flasks | 6 | 8 | France 7. |
| Molybdenum: | | | |
| Ore and concentrate | (1) | 50 | All from Canada. |
| Metal including alloys, all forms | r 95 | 114 | Canada 105; United States 8. |
| Nickel metal including alloys, all forms | 242 | 155 | United States 37; Canada 30; West Germany 24. |
| Platinum and other metals of platinum group, unwrought and semimanufactures ---- troy ounces | -- | 40 | All from France. |
| Silver: | | | |
| Silver leaf and silver foil ---- do | -- | 393 | United States 237; Japan 156. |
| Silver, including silver gilt and platinum-plated silver, unwrought and semimanufactures ---- do | -- | 185 | All from Japan. |
| Tin: | | | |
| Oxides ---- long tons | 1 | 1 | Mainly from Japan. |
| Metal including alloys, all forms ---- do | r 1,603 | 651 | Malaysia 373; Japan 239. |
| Titanium: | | | |
| Rutile ores and concentrates | 2 918 | 615 | Australia 595; Japan 20. |
| Oxide and hydroxide | r 4,377 | 4,507 | Australia 1,488; West Germany 916; United States 820. |
| Tungsten metal including alloys, all forms | 1 | 3 | Australia 1; United States 1. |
| Zinc: | | | |
| Ore and concentrate | -- | 185 | Australia 150; Japan 30; United Kingdom 5. |

See footnotes at end of table.

## Table 3.—Philippines: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Zinc—Continued | | | |
| Oxide and peroxide | 748 | 496 | Taiwan 310; United States 64; West Germany 29. |
| Metal including alloys: | | | |
| Scrap | -- | 20 | All from Japan. |
| Unwrought and semimanufactures | 13,858 | 12,044 | Japan 4,290; Australia 3,935; United States 1,295. |
| Other: | | | |
| Ores and concentrates of base metals, n.e.s | -- | 30 | All from Australia. |
| Ash and residue containing nonferrous metals | -- | 179 | Japan 130; Australia 49. |
| Oxides, hydroxides and peroxides of metals, n.e.s | 453 | 127 | Japan 52; United States 46; Norway 16. |
| Nonferrous base metals including alloys, all forms, n.e.s | r 45 | 35 | Netherlands 11; Japan 10; United States 3. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 435 | 478 | Greece 154; Netherlands 117; Italy 60. |
| Dust and powder of precious and semiprecious stones | 8 | 2 | Mainly from Australia. |
| Grinding and polishing wheels and stones | r 506 | 521 | Republic of Korea 100; United Kingdom 91; West Germany 91. |
| Asbestos | 2,235 | 3,284 | Canada 2,475; United States 266; Mozambique 131. |
| Barite and witherite | 4,069 | 2,361 | Singapore 1,399; United States 842; Italy 70. |
| Boron materials: | | | |
| Crude natural borates | 30 | -- | |
| Oxide and acid | 529 | 589 | Mainly from United States. |
| Cement | 12,383 | 7,835 | Japan 5,830; Republic of Korea 954; Taiwan 599. |
| Chalk kilograms | -- | 334 | All from United States. |
| Clay and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite and fuller's earth | 17,411 | 14,471 | Japan 14,044. |
| Fire clay | 267 | 203 | United Kingdom 110; United States 73; Japan 20. |
| China clay (kaolin) | 5,023 | 5,844 | United States 2,698; Republic of Korea 1,031; United Kingdom 841. |
| Other | 13,331 | 15,317 | United States 12,829; Japan 1,365. |
| Products: | | | |
| Refractory (including nonclay bricks) - value, thousands | $4,952 | $3,651 | United Kingdom $917; Japan $883; United States $798. |
| Nonrefractory do | $65 | $47 | Japan $24; United States $13; United Kingdom $10. |
| Cryolite and chiolite | -- | 1 | All from Switzerland. |
| Diamond, industrial carats | 53,269 | 81,000 | Congo 70,100; United Kingdom 5,600; Australia 4,400. |
| Diatomite and other infusorial earth | 645 | 693 | United States 439; Republic of Korea 170; France 50. |
| Feldspar and fluorspar | 2,509 | 2,564 | Republic of Korea 638; Italy 550; Japan 534. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | -- | 50 | All from Belgium. |
| Phosphatic | 164,024 | 171,401 | United States 171,101. |
| Manufactured: | | | |
| Nitrogenous | 145,876 | 156,403 | Japan 132,151; Australia 22,606; West Germany 1,500. |
| Phosphatic | 4,731 | 14,201 | United States 12,557; Netherlands 753; West Germany 500. |
| Potassic | 83,897 | 84,543 | Canada 51,173; United States 16,779; Israel 10,979. |
| Other, including mixed | 307 | 271 | West Germany 140; Belgium 100; Spain 28. |
| Ammonia | 89,208 | 80,048 | Japan 65,892; Australia 14,148. |
| Graphite, natural | 209 | 146 | Japan 65; Norway 24; United States 21. |

See footnotes at end of table.

## Table 3.—Philippines: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Gypsum and plasters: | | | |
| Gypsum | [3] 20,239 | 40,007 | Australia 39,458; West Germany 396. |
| Plasters | ([4]) | 4,253 | West Germany 4,188; Japan 20. |
| Lime | 30 | 598 | United Kingdom 312; West Germany 286. |
| Magnesite | 1,046 | 1,854 | Japan 1,241; Austria 318; United States 118. |
| Mica: | | | |
| Crude, including splittings and waste | 68 | 93 | India 52; United States 23; United Kingdom 9. |
| Worked, including agglomerated splittings | 3 | 19 | India 9; Hong Kong 5; West Germany 2. |
| Pigments, mineral: | | | |
| Natural, crude | 2,023 | 2,650 | United Kingdom 1,543; India 990; Belgium 98. |
| Iron oxides, processed | r 648 | 819 | West Germany 376; Spain 169; India 312. |
| Precious and semiprecious stones natural, except diamond -- carats | 1,558 | 17,808 | All from Hong Kong. |
| Salt | 104,692 | 21,184 | India 9,983; Ethiopia 8,827; Hong Kong 1,000. |
| Sodium carbonate, natural and manufactured | 47,759 | 75,832 | United States 41,815; Kenya 20,000; Japan 11,672. |
| Sodium compounds, caustic soda | 8,073 | 9,198 | Netherlands 2,190; West Germany 1,885; Spain 1,249. |
| Stone, sand and gravel: | | | |
| Dimension stone, crude and worked | 102 | 94 | Taiwan 41; Italy 34; Japan 15. |
| Dolomite | 7,010 | 8,662 | Japan 6,333; Taiwan 862; Austria 838. |
| Gravel and crushed stone | 188 | 371 | Japan 221. |
| Limestone (except dimension) | r 1,469 | 1,642 | Japan 1,495; Taiwan 139; West Germany 8. |
| Quartz and quartzite | 175 | 126 | Netherlands 58; Sweden 44; United Kingdom 20. |
| Sand: | | | |
| Silica | ([5]) | 7,376 | South Vietnam 7,246; United States 59; Japan 41. |
| Other | [6] 14,888 | 239 | United States 109; Japan 81. |
| Stone for industrial uses (including soapstone), n.e.s | 1 | 202 | Republic of Korea 180. |
| Sulfur: | | | |
| Elemental, all forms | r 21,687 | 10,119 | Iran 8,797; Belgium 425; West Germany 424. |
| Sulfur dioxide | 87 | 181 | Japan 100; West Germany 45; Netherlands 26. |
| Sulfuric acid | 14 | 229 | Japan 194; United States 31. |
| Talc | [7] 3,797 | 5,779 | Republic of Korea 4,901; United States 465. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 171 | 5,032 | Japan 5,030; West Germany 2. |
| Oxides and hydroxides of magnesium, strontium and barium | 248 | 184 | Australia 60; United States 57; United Kingdom 52. |
| Bromine, iodine and fluorine | 1 | 1 | Mainly from United States and France. |
| Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s | 308 | 757 | United States 295; Japan 285; Finland 59. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 1,490 | 1,151 | Japan 969; Netherlands 87; United Kingdom 57. |
| Carbon black | 3,017 | 802 | United States 490; Japan 124; Australia 87. |
| Coal, coke and briquets | 14,322 | 10,373 | Japan 8,490; United States 1,324; Taiwan 559. |
| Hydrogen and other rare gases thousand tons | 106 | 159 | Japan 146. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | r 68,086 | 68,067 | Saudi Arabia 36,933; Kuwait 18,141; Iran 6,512. |

See footnotes at end of table.

Table 3.—Philippines: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum—Continued | | | |
| Refinery products: | | | |
| Gasoline: | | | |
| Aviation thousand 42-gallon barrels | 103 | 173 | Bahrain 84; Singapore 48; Iran 37. |
| Motor do | 82 | (8) | |
| Kerosine and jet fuel do | 22 | -- | |
| Distillate fuel oil do | 64 | -- | |
| Lubricants (including grease) do | r 703 | 950 | United States 375; Japan 240; Singapore 102. |
| Other: | | | |
| Liquefied petroleum gas do | 62 | NA | |
| Naphtha do | 164 | 503 | Singapore 358; Taiwan 144. |
| Mineral jelly and wax do | 76 | 108 | Indonesia 60; Japan 13; United States 13. |
| Unspecified do | 11 | 14 | United States 7; Australia 2; Taiwan 1. |
| Total do | r 1,287 | 1,748 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 1,850 | 274 | Norway 150; Japan 101; Taiwan 8. |

r Revised. NA Not available.
1 Ores and concentrates of base metals for 1972 are included in rutile ores and concentrates. See footnote 2.
2 Includes ores and concentrates of titanium, vanadium, molybdenum, tantalum, and zirconium.
3 Includes plasters.
4 Included in gypsum.
5 Included in other sand.
6 Includes silica sand.
7 Includes pharmaceutical grade talc.
8 Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Reynolds International, Inc., and the Philippine Government signed an agreement to build a 100,000- to 200,000-ton-per-year smelter in Western Leyte. This first Philippine venture into primary aluminum production was to be contingent on the availability of economic power. The plant was scheduled to use government-supplied geothermal power if current exploration proved resources exist in sufficient magnitude. Preference was designed to be given to domestic sources for raw materials, which included bauxite deposits in Samar, aluminous clay deposits in Leyte, and aluminous laterite deposits in Mindanao. However, it was agreed that alumina or bauxite could be supplied by Reynolds from foreign sources such as Australia.

A consortium of aluminum companies headed by Commonwealth Aluminium Corp. Ltd. of Australia considered locating a 1.5-million-ton-per-year alumina plant on Mindanao using bauxite imported from Australia.

**Chromite.**—The Philippines produced 8% of the world's chromite in 1974 although production decreased 9% under 1973 to a total of 530,000 tons. Unit value increased 21%, primarily during the second half of the year. Chromite contributed 2% to the value of mineral production.

Refractory-grade chromite was mined in Masinloc, Zambales, by Benguet Consolidated, Inc. for Consolidated Mines, Inc. This was the only source of this material. Production decreased 11% to 429,000 tons. All material was exported, primarily to the United States, Japan, the United Kingdom, and Italy, in that order. Open pit mine reserves were becoming depleted according to Benguet. Consequently, they were developing an underground mine at Masinloc. Total reserves at Masinloc were estimated at 2.7 million tons with possible depletion within a decade.

Metallurgical-grade chromite was produced exclusively by Acoje Mining Co. Inc. also in Zambales. Production increased 5% to 100,000 tons. All material was exported to Japan.

Total chromite exports reached 605,000 tons in 1974, 1% over those of 1973. Exports to the United States were 43% less in the second half than in the first half of 1974. Exports during the second half of 1974 increased to the United Kingdom, Italy, Brazil, and Australia.

Table 4.—Philippines: Production and exports of chromite, 1974
(Thousand dry metric tons and thousand dollars [1])

| | Quantity | | Value | |
|---|---|---|---|---|
| | 1974 | 1974, 2d half only | 1974 | 1974, 2d half only |
| Production: | | | | |
| Refractory: Consolidated Mines Inc | 430 | 204 | -- | -- |
| Metallurgical: Acoje Mining Co. Inc | 100 | 53 | -- | -- |
| Total | 530 | 257 | -- | -- |
| Exports by country of destination: | | | | |
| Refractory: | | | | |
| Argentina | 6.0 | 3.0 | 149 | 80 |
| Australia | 9.6 | 9.6 | 233 | 233 |
| Brazil | 19.5 | 14.5 | 439 | 323 |
| Canada | 18.8 | 8.0 | 427 | 205 |
| Chile | 8.8 | 3.0 | 211 | 79 |
| Italy | 35.8 | 25.5 | 823 | 594 |
| Japan | 85.3 | 40.9 | 1,906 | 950 |
| Netherlands | 10.1 | 4.3 | 223 | 103 |
| Peru | 2.0 | -- | 40 | -- |
| Taiwan | 1.3 | 1.3 | 30 | 30 |
| Thailand | 2.0 | 2.0 | 43 | 43 |
| United Kingdom | 64.6 | 44.7 | 1,504 | 1,064 |
| United States | 226.9 | 82.4 | 4,770 | 1,916 |
| Venezuela | 6.5 | -- | 133 | -- |
| West Germany | 4.8 | -- | 99 | -- |
| Yugoslavia | 3.0 | -- | 46 | -- |
| Total | 505.0 | 239.2 | 11,076 | 5,620 |
| Metallurgical: | | | | |
| Japan | 99.7 | 53.7 | 3,480 | 2,138 |
| Grand total | 604.7 | 292.9 | 14,556 | 7,758 |

[1] Exchange rate: P6.72=US$1 in 1st half of 1974; P6.85=US$1 in 2d half of 1974.

**Copper.**—The Philippines produced 3% of the world's copper as concentrate for shipment to foreign smelters. Production increased 1% over that of 1973 to 224,000 tons of contained copper. Total value equaled $408 million or 58% of the country's total mineral production value. Total value of copper exports was $393 million, an increase of 17% over that of 1973. Ninety-three percent of the concentrate was exported to Japan and 3% was shipped to the United States. The remainder went to the Republic of Korea, Taiwan, and Belgium.

Most of the copper concentrate was from low-grade, 0.5% porphyry ore, usually with gold and silver byproducts. Atlas Consolidated Mining & Development Corporation, the leading producer, operated the largest copper mine in southeast Asia and produced, in Cebu, 38% of the Philippine's material. Known reserves at that location, 617 million tons of 0.47% ore, were estimated to allow operation for 30 years at current production rates. Production by Marcopper Mining Corp., the country's second largest producer, at 20% of national volume, was down 40% in the second half of 1974. However, early in the year, a mill expansion was scheduled for completion late in 1975 at their main facility in Marinduque. Marinduque Mining & Industrial Corp. continued as the third largest producer with 15% of the total volume and early in 1974 planned to expand their Sipalay mine. Philex Mining Corp. became the country's fourth largest producer with 12% of the total volume and early in 1974 planned further expansion. Production of Lepanto Consolidated Mining Co. fell to 6% of the total volume and became the country's fifth largest producer because of environmental difficulties encountered by their only customer, American Smelting & Refining Company (ASARCO), in processing their high-arsenic ore. Production was 43% below that of 1973. It was reported that environmental regulations may cause complete closure of ASARCO's smelter at Tacoma, Wash.

Early in 1974, plans were revealed to build two smelters in the Philippines as a means of increasing national productivity and broadening the copper market. Marinduque Mining and Lepanto Consolidated planned a 100,000-ton smelter, using the

Outokumpu Oy flash-smelting method, and a refinery in Northern Luzon as a joint venture with the Government. Atlas planned to construct a flash smelter on Cebu near its mine. Both smelters were contingent on the availability of electrical power. The Government planned to develop a geothermal facility on Cebu. Both facilities were scheduled for operation in 1977 or 1978 at the earliest.

Benguet discovered sizable deposits of porphyry ore containing 0.55% to 0.6% copper in Abra and Benguet Provinces. Another very large deposit was discovered in eastern Mindanao.

Plans for expansion in the domestic copper industry were generally shelved late in 1974 because of rising production costs and drastically lowered world prices which fell from $1.40 per pound early in 1974 to $0.50 per pound early in 1975. Atlas claimed production costs of $0.60 to $0.65 per pound in October 1974. Many marginal mines closed and one small company folded late in the year. Atlas announced late in 1974 that its scheduled new mine and mill expansion in Cebu would not materialize until a dramatic turn for the better was observed in the world market. The tight situation was further aggravated by a 6% export tax on concentrate and by announced cutbacks in Japanese imports.

In February the Government began extracting a 30% premium duty on concentrate valued over an established basic price. However, in view of the depressed market, the 6% export tax was reduced to 2% in December. In the meantime, Japan requested in December a 10% to 40% reduction in copper concentrate shipments in view of its increasing stockpile and announced a 25% cutback in copper production.

**Table 5.—Philippines: Copper production by major producers [1]**
(Thousand dry metric tons)

| Company | Concentrate | | Direct-shipping-grade ore | | Copper content |
|---|---|---|---|---|---|
| | 1974 | 1974, 2d half only | 1974 | 1974, 2d half only | |
| Acoje Mining Co. Inc | 12.8 | 4.8 | -- | -- | 2.2 |
| Atlas Consolidated Mining & Development Corp | 313.7 | 164.0 | -- | -- | 87.4 |
| Baguio Gold Mines | 15.6 | 8.3 | -- | -- | 3.5 |
| Benquet Consolidated Inc | 8.5 | 4.5 | -- | -- | 2.4 |
| Black Mountain Inc | 12.0 | 5.8 | -- | -- | 2.9 |
| Consolidated Mines Inc | 6.9 | 2.8 | -- | -- | 1.5 |
| Lepanto Consolidated Mining Co | 47.6 | 19.2 | -- | -- | 14.7 |
| Marcopper Mining Corp | 164.6 | 64.3 | -- | -- | 46.9 |
| Marinduque Mining and Industrial Corp.: | | | | | |
| Bagacay | 30.4 | 15.1 | 18.7 | 12.5 | 7.0 |
| Sipalay | 92.4 | 47.0 | -- | -- | 24.3 |
| Philex Mining Corp | 100.3 | 50.6 | -- | -- | 26.2 |
| Western Minoleo | 19.9 | 13.1 | -- | -- | 5.4 |
| Total | 824.7 | 399.5 | 18.7 | 12.5 | 224.4 |

[1] Companies producing less than 1,000 tons copper content excluded from list.

**Gold.**—Gold continued as an important commodity equaling 1.3% of world production. However, production continued to drop, decreasing 6% in volume, to 536,000 troy ounces, although it increased 54% in value due to a dramatic 64% increase in selling price to a 1974 average of approximately $151 per troy ounce. Gold production provided 11% of total mineral value.

Production was dominated by five companies which together provided 83% of 1974 total production. Although Benguet, the largest producer, mined 25% of the country's gold, 135,000 troy ounces, production fell 27% becuase of its depleting ore reserves. Nevertheless, Benguet's gold output boosted company earnings to an alltime high and provided 55% of their 1974 income. The gold was taken from two mines, Acupan and Antamok, on Luzon. Benguet's gold production had declined steadily since 1968 and plans were made to conduct a 10-year exploration and ore body development project, on a tax-free basis. Unit production costs incurred by

Benguet increased due to inflation and higher energy costs, to a reported $107 per ounce.

Gold produced by the other four major companies was contained in copper concentrate which was shipped abroad, primarily to Japan, where the gold was recovered through smelting and credited to the Philippine Government. High production by Philex Mining continued. It was the country's second largest producer with gold accounting for 40% of company sales. Marcopper Mining's output increased 82% and it became the country's third largest producer with 15% of the country's production. Atlas Consolidated decreased production 10% and was the fourth largest producer with 11% of total output. Production by Lepanto Consolidated declined 44% because of curtailed copper production and Lepanto became the country's fifth largest producer with 10% of total output. Lepanto planned to put a new 10,000-ton-per-day copper concentrator into operation. The associated deposit has a reserve of 94 million tons of ore containing 0.5% copper and 0.004 ounce per ton of gold. Intensive exploration was being undertaken by Lepanto in promising districts of Paracale (Camarines Norte) and Surigao.

Exports totaled 542,000 troy ounces in 1974. Japan received 55% of this total, the United Kingdom purchased 31%, and the United States received 10%.

A decision was finalized by the Central Bank to set up a gold refinery with sufficient capacity to process all domestic gold-silver bullion production. Plant operation was scheduled for early in 1975. The plant was to have provisions for future expansion to refine byproduct gold as soon as a copper smelter was built in the country. The capability would enable the Government to stockpile gold more readily. During 1974, gold production was encouraged by the Government's guarantee to purchase all private output at a price above production cost. The producers were free to sell on the world market if they preferred.

Government support and high prices stimulated new gold-mining ventures and mine reopenings. Twelve small operators produced 17% of the country's 1974 output. Baquio Gold Mining Co. and Black Mountain Inc. both increased production 25%. Omico Mining and Industrial Corp. undertook a $560,000 mill expansion to a 500-ton-per-day capacity. Paracale-Gumaus Mining Co. reopened a mine in the Paracale District of Camarines Norte. Golden River Mining Corp. planned a $3.3 million facility in Paracale District, scheduled to produce 13,000 troy ounces of gold over a 10-year period. Acoje Mining produced 1,200 troy ounces in 1973.

The outlook at the end of the year was that gold production would increase as long as world prices remained steady.

**Iron Ore.**—Iron ore production decreased 29% to 1.6 million tons, due to high production costs. Total value, which decreased 26%, provided approximately 2% of total mineral production. Inco Mining Corp., through facilities expansion, became the leading producer. Filmag (Philippines) Inc. continued to operate at near full capacity producing 610,000 tons. These two largest producers provided 79% of total production. The other major producer, Philippine Iron Mines Inc., closed all facilities midway through the year except for a small iron sand operation. The three other smaller producers closed completely during the first half of the year. Production during the second half decreased 28% compared with the first half of the year.

Exports of iron decreased 23% to 1.5 million tons and went entirely to Japan, except for 111,000 tons which were shipped to the United States by Long Beach Mining Corp., during the first half of the year.

Kawasaki Steel Corporation signed a letter of intent to build a 5-million-ton iron ore sintering plant in Northern Mindanao at an estimated cost of $220 million. The ore would be imported from Australia and the sintered product would be exported to Japan.

Table 6.—Philippines: Production and export of iron ore, 1974
(Thousand dry metric tons and thousand dollars)

| | Production | | Export | | | |
|---|---|---|---|---|---|---|
| | | | Quantity | | Value[1] | Country of destination |
| | 1974 | 1974, 2d half only | 1974 | 1974, 2d half only | 1974 | |
| Anglo-Phil Oil & Mining Co | 41 | -- | 36 | -- | 236 | Japan. |
| Atlas Consolidated Mining & Development Corp | 21 | -- | -- | -- | -- | |
| Filmag (Philippines) Inc | 610 | 311 | 450 | 185 | 3,295 | Japan. |
| INCO Mining Corp | 668 | 361 | 713 | 355 | 5,387 | Do. |
| Long Beach Mining Corp | 63 | -- | 111 | -- | 614 | United States. |
| Philippine Iron Mines | 205 | 7 | 199 | -- | 1,717 | Japan. |
| Total | 1,608 | 679 | 1,509 | 530 | 11,249 | |

[1] Exchange rate: ₱6.72=US$1 in 1st half of 1974; ₱6.85=US$1 in 2d half of 1974.

**Nickel.**—Acoje Mining, the country's only nickel producer, continued to operate a small mill in Santa Cruz, Zambales, and produced nickel-cobalt sulfide concentrate containing 326 tons of nickel which was shipped to Japan for smelting. Ore reserves in Acoje's small dunite deposit were estimated to be sufficient for approximately 15 years at current extraction rates.

A $270 million mine and refinery complex with a capacity of 34,000 tons of nickel was put into operation in December on Nonoc Island by Marinduque Mining and Industrial Corp. Using the Sherritt-Gordon hydrometallurgical extraction process the operation was scheduled to produce annually 31,000 tons of pure nickel in powder or briquet form and a mixed sulfide concentrate byproduct containing 3,000 tons of nickel and 1,500 tnos of cobalt which was to be shipped to Japan for smelting. Full plant operation was scheduled before the end of 1975 and would produce the world's first commercially refined nickel directly from lateritic ores. New nickel laterite reserves were discovered boosting the country's huge nickel laterite reserves to 33 million tons of contained nickel at an average concentration of 0.93%. Most Philippine nickel ores were determined to be lateritic. It was observed that the new Marinduque operation would make the Philippines the second largest producer in Asia with approximately 5% of the world's nickel production.

The Philippine Government suggested that nickel would likely replace copper as the country's primary mineral commodity. Although encouraging development to produce shipping-grade concentrate to Japan, the Government insisted that private exploiters plan facilities for conversion to metal. Atlas Consolidated was given permission to build a 34,000-ton mine-refinery complex on Palowan in a joint venture with Mitsubishi Metal Corporation. Atlas had discovered three laterite deposits on Palowan and a laterite deposit in Davao containing a total of 4.8 million tons of nickel at an average concentration of 1.3%. Engineering studies to recover metal by the Freeport ammonia-leach process were completed. New Frontier Mines and Hochmetals of Panama were given permission to install a 15,000-ton smelter in northern Luzon.

Rio Tuba Nickel Mining Corp. announced plans to build a mine-concentrator complex on Palowan using a silicate ore containing an average of 2.19% nickel. The joint operation, with Pacific Metals Co. Ltd., a Japanese firm, was scheduled to begin in 1976. Olympic Mines and Development Corp. announced plans to mine lateritic ore at Pulot and Toronto on Palowan and ship it to Japan for smelting. Blue Ridge Mineral Corporation acquired mineral rights to certain laterite deposits in southern Mindanao near Davao. Reserves were estimated to contain 1.5 million tons of nickel at an average concentration of 1.29%. Exploration for nickel laterites was begun by Benguet Consolidated.

**Silver.**—Silver production decreased 10% to 1.7 million troy ounces but increased 80% in total value due to a doubling in unit value. Most of the silver values were in copper concentrates which were smelted

in Japan, and the Philippine Government was credited for the silver content. All of the major copper producers provided this silver- and gold-containing copper concentrate with the exception of Marinduque Mining and Industrial Corp. Silver output value equaled 1% of total Philippine mineral value. Production equaled 0.6% of world silver production. Hong Kong was the major importer of Philippine silver receiving 308,000 troy ounces of rolled material. Exports of silver in other forms including gilt, alloys, and platinum-plated material went to Japan, 134,000 troy ounces; the United Kingdom, 51,000 troy ounces; and France, 16,000 troy ounces.

**Other Metals.**—Production of zinc ore and concentrate increased 45% to 7,772 tons of contained metal. It was mostly smelted in Japan. A smaller amount of lead ore was produced. Small quantities of platinum and palladium were produced, exclusively by Acoje Mining. The values were contained in nickel concentrate which was smelted in Japan. Smelting credits reportedly decreased 45% in volume but only 13% in value. A small quantity of mercury was produced and exported to Japan; production decreased 62%. Approximately 2,000 tons of manganese concentrate was shipped to Taiwan and Japan; production decreased 78%. The country's reserves of high-grade manganese were reported to be small.

## NONMETALS

**Cement.**—Cement produced and used decreased 14% to 3.5 million tons but increased 52% in total value. Volume equaled 0.5% of world production and value equaled 15% of Philippine mineral production making cement the country's second most important mineral commodity. Capacity did not change significantly remaining at 6 million tons. Inventories increased approximately one-third. The ban placed on exports near the end of 1973 was lifted in June. Exports decreased 24% to 756,000 tons. The OPEC nations received 39% of 1974 cement exports; Hong Kong, 18%; Bangladesh, 17%; and Indonesia, 7%. The remainder went to Oceania and other southeast Asian countries.

Midland Cement Corp. built a 600,000-ton plant at Balingbing near Tanay in Rizal Province and became the country's third-ranking producer; production began in April.

**Clays.**—Clay production increased slightly in volume and considerably in value but firm data were unavailable. Clay production in 1973 totaled 256,000 tons. A 45,000-ton bentonite mine and crushing and drying plant was built as a joint venture of Lepanto Exploration (Asia) Inc. and Filmag (Philippines) Inc. The plant was scheduled to start in February 1975.

**Fertilizer Materials.**—Total production of fertilizer materials increased 38% to 172,000 tons but did not meet domestic demand. Value equaled 1.5% of total mineral value. Eighty-five percent of fertilizer demand was met by imports, primarily from Japan, Spain, and the United States. Japan exported approximately 300,000 tons of fertilizer material including 200,000 tons of urea to the Philippines.

Production of phosphate rock increased 117% to 26,500 tons and increased 170% in value, but this met only 10% of domestic demand for phosphate fertilizers. Imports from the United States included 154,000 tons of phosphate rock, 19,000 tons of superphosphate, and 20,000 tons of ammonium phosphate. Spain supplied 150,000 tons of superphosphate.

Guano production increased greatly to about 14,000 tons. Potassium fertilizers, totaling 90,000 tons, were imported from the United States and Canada. Ammonium sulfate totaling 160,000 tons was imported from Japan, West Germany, and other countries.

Pyrites production increased 24% to 253,000 tons and equaled 1% of world output. Approximately 90% of this material was a byproduct concentrate from copper ore flotation produced by Atlas Consolidated and by Marinduque Mining and Industrial Corp. Most of this production was converted to ammonium sulfate by domestic fertilizer producers and a smaller quantity was shipped to Japan. The other 10% was mined by Benguet Consolidated for shipment to Japan. Japan imported a total of 66,000 tons of unroasted pyrites from the Philippines. The Republic of Korea imported 5,000 tons of this material.

**Gypsum.**—Byproduct gypsum was produced by the phosphate fertilizer industry. Only 1% of the gypsum output was mined. Gypsum production increased 24% to 126,000 tons and all was used domestically. Value reportedly increased by a factor of

4.6 and equaled 0.7% of total domestic mineral production. Imports from Australia from July 1, 1973 to June 30, 1974 totaled 40,000 tons. During 1973, 99% of gypsum imports had come from Australia.

**Lime.**—Lime production decreased 33% to 101,000 tons after having suffered a 46% drop in 1973. Value reportedly increased by a factor of 2.4 and equaled 0.2% of total domestic mineral production. World trade had been negligible during 1973.

**Salt.**—Salt production, by evaporation of sea water, decreased 3% to 214,000 tons. Total value increased 44% and equaled 1% of total domestic mineral value. Nearly 10% of salt demand had been met by importation in 1973, from India and Ethiopia.

**Sand and Gravel.**—Production of glass sand increased 36% to 689,000 tons. Total value of silica sand increased 58% and equaled 0.2% of domestic mineral value. Production data on common sand and gravel were not available.

**Stone.**—Stone production, 99% of which was limestone, totaled 6.7 million tons and total value equaled 0.6% of domestic mineral production. Limestone use was 77% for cement and 4% for lime production. Use of limestone for cement production increased 13% in volume and 44% in value.

Production of unfinished marble decreased 28% to 6,500 tons, and total value decreased 7%. Production of finished marble increased 63% to 100,000 square meters but did not change in total value. Finished marble was exported, primarily to Japan.

**Other Nonmetals.**—Feldspar production suffered a 59% decrease to approximately 10,000 tons, and a total value decrease of 6%. Production had decreased 46% in 1973. Barite demand was met by an estimated production of 3,300 tons supplemented by imports totaling 2,400 tons. Production of an additional 1,000 tons per month in a new $1 million mill at Mansalay, Mindoro, was scheduled to begin by midyear. The operator, Falcon Rare Metals and Industrial Minerals, estimated its barite reserve at 80,000 tons. Production of perlite continued to grow increasing 37% to about 1,150 tons. Talc production increased 3% to approximately 1,700 tons and increased 32% in total value in partial fulfillment of demand. Six-thousand tons of talc had been imported in 1973, mostly from the Republic of Korea. In 1974, 2,100 tons was imported from the Republic of Korea.

## MINERAL FUELS

**Coal.**—Coal production increased 30% to 51,000 tons and increased 330% in value. All production was consumed domestically. Imports of coke, primarily from Japan, totaled 22,000 tons. Imports of coal totaled 5,000 tons, primarily from North Vietnam.

**Petroleum.**—The Philippines continued to meet its oil demands by importation, 94% from the Middle East. Imports of crude oil plus finished petroleum products decreased 2% in 1974. Imports of crude oil decreased 9% in volume, to 62.2 million barrels, but increased in value by a factor of 3.4, to $573 million. Imports of petroleum finished products increased in volume by a factor of 3.7, to 6.4 million barrels, and increased in value by a factor of 3.9, to $77 million. The breakdown of finished products was gas and diesel fuel, newly introduced from Bahrain, 59%; naphtha, mainly from Singapore, 15%; lubricants, from Singapore, the United States, and other countries, 14%; gasoline, from Iran, Bahrain, and Singapore, 10%; and other products.

Saudi Arabia supplied 55% of all petroleum products imports and became the Philippines' third largest trading partner. Other Mideast sources were Kuwait, 24%; Iran, 7%; Bahrain, 4%; and Qatar, 4%. Nearly all of the remainder came from Asiatic countries, including Sarawak, 3%; PRC, 1%; and Singapore, 1%.

Filoil's refinery in Cavite was closed during the first quarter because crude deliveries from Kuwait were suspended. It was announced in February that Kuwait would deliver 5.4 million barrels of crude to Filoil over the following 6 months at $11.54 per barrel. Import deliveries were somewhat sporadic during the first quarter because of the unsettled status of the Philippines in the opinion of OPEC. However, total import volume during the first half of 1974 were not significantly different from the second half.

The first shipment of Chinese petroleum arrived in October and total imports from the PRC during 1974 were valued at $6.8

million for crude and $0.4 million for petroleum products. The waxy, low-sulfur crude was directed for use as bunker fuel.

A trade pact was made with Mexico for importation of 10,000 barrels per day during 1975, equal to 5% of expected total petroleum imports. A trade mission visited the Soviet Union with an aim to import petroleum. Imports during 1975 were expected to total 70 million barrels.

Consumption of finished petroleum products, mostly produced in Philippine refineries, decreased 12% in volume but increased 104% in value. During the first half of 1974, consumption totaled 30.4 million barrels of finished products consisting of the following: Residual fuel oil, 48%; motor gasoline, 24%; distillate fuel oil, 20%; and jet fuel and kerosine, 8%.

Taxes on most oil products were raised in February and again in April. However, rationing was ended in March because of the easing of import supply problems. Fuel oil prices to industry, including cement producers, were cut 5% in October. Plans were made to increase tariffs on lubricants from 30% to 50% in January 1975 to protect the local manufacturer, Mobil Oil Philippines Inc. Finished products were produced at five refineries: Caltex (Philippines), Inc., at Bauan in Batangas, the largest; Mobil in Bataan; Shell Philippines Inc. in Tabango; Philippines National Oil Co. in Bataan; and Filoil Refinery Corporation in Cavite. The country's main powerplant, operated by Manila Electric Co., consumed 25,000 barrels of fuel oil per day. Most of the crude imported from the PRC was consumed directly at this plant.

A total of 1.1 million barrels of finished products, equaling 1.7% of production and totaling $17.3 million in value, were exported. These products and their destinations were: Gas and diesel oil, 32%, to the United States, Pacific Islands, Guam, and other countries; residual fuel oil, 21%, to the United Kingdom, Panama, Liberia, and other countries; kerosine, 26%, to the United States and other countries; and motor gasoline, 10%, to the Pacific Islands, Guam, and other countries; plus smaller quantities of lubricants and asphalt.

Exploration for petroleum, and oil well drillings in the Philippines continued at a slow pace. About eight wells were drilled by foreign companies during the 3-year period, 1972–74. All wells were dry. The Government encouraged application of foreign capital and technical expertise to exploration, particularly offshore. It was reported in April that Superior Oil Co. had found traces of oil and gas in the Sulu Sea. Offshore petroleum had been found north of Borneo near the Sulu Sea. In July, six regions of the country were opened to gas exploration. Drilling of seven offshore wells, five in the southern Philippines and two in southern Luzon, and one onshore well in northern Luzon was scheduled for 1975. Involved foreign companies were Amoco Philippines, Inc., Mobil, Oriental Petroleum and Minerals Corporation, Seafront Petroleum and Mineral Resources Inc., Sun Oil Co., and Trend Corp. The PRC was invited to participate. Despite active government encouragement, participation by foreign countries was limited by certain government-imposed conditions such as inclusion of a Philippines partner, with the Government taking the largest share of the profits.

# The Mineral Industry of Poland

By Tatiana Karpinsky [1]

In 1974 Poland ranked 10th among the world's industrial nations and accounted for about 2.2% of global industrial output. Poland accounted for approximately 2.2% of world fuel output, 3% of the total production of sulfuric acid, 2.2% of cement and steel production, and 1.4% of the world output of electric power.

Poland was the world's 5th largest producer of coal in 1974, and ranked 4th in the production of sulfur, 8th in zinc production, 10th in the production of cement, 10th in the production of refined copper, and 22d in the production of aluminum.

Poland's estimated share of the total industrial production of all the Council for Mutual Economic Assistance (CMEA)[2] countries was about 8.1% in 1974 and was exceeded only by the U.S.S.R. According to Polish sources, in terms of output per capita, Poland ranks 17th among the world's industrialized nations. The total value of gross industrial production in 1974 amounted to Zl 1573.3 billion,[3] compared with Zl 1409.9 billion in 1973, an increase of 11.6%. Among branches of industry, the electrical and manufacturing industries are the most important. In 1974 they contributed 30% of Poland's total industrial output. The metallurgical industry contributed 11%; the chemical industry contributed 9.4%; the mining industry, 6%; mineral processing, 3.9%; and the fuel industry, about 9.1%.

Poland has large reserves of coal, lignite, sulfur, copper ore, salt, lead and zinc ores, and smaller amounts of aluminum ores. Reserves of iron, crude oil, natural gas, chromium, manganese, mercury, tin, and potassium salts are relatively modest.

## PRODUCTION

Coal is important to Poland since it is the major fuel used for development of its industry. The increase in the production of hard (bituminous) coal in Poland in 1974 was 5.4 million tons, or 3.4%, as compared with its production in 1973. Brown coal output increased 610,000 tons, or 1.5%. Brown coal production was being developed so that more hard coal could be released for export, and thus improve the balance of trade. In 1974 there were 69 mines producing hard coal, and 2 underground and 7 surface mines producing brown coal.

Over the recent past, coal production has followed the planned steadily rising trend which is to be extended into the future. Two new coal mines came into operation in December 1974 which, when fully developed, are expected to add 22,000 tons per day productive capacity at Upper Silesian mines. These two mines, the Slask and Pniowek, are located respectively west and south of Katowice. The Slask mine initially extracted 1,500 tons per day, and in 1978 the output is to be 7,000 tons per day. The Pniowek mine in 1981 is to extract 15,000 tons of coking coal per day.

In 1974 a preliminary decision was made to develop a complex of underground coal mines at newly discovered deposits in the Lublin region. It was also planned to con-

[1] Foreign mineral specialist, International Data and Analysis.

[2] CMEA-Council for Mutual Economic Assistance comprising the following countries: Bulgaria, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and U.S.S.R.

[3] Where necessary values have been converted from Polish Zolty (Zl) to U.S. dollars at the official exchange rate of Zl 13.32=US$1.00 (basic rate), Zl 19.92=US$1.00 (special commercial rate).

struct a full-power complex in the Belchatow region, which will consist of a brown coal open pit and two electric powerstations. It is assumed that mines in the Lublin Basin will produce about 25 million tons of hard coal per year and the open pits in the Belchatow region will produce 40 million tons of brown coal per year.

In 1974 production of iron ore (1.3 million tons) remained far below expanding national requirements. An additional 15.6 million tons was imported during the year. Imports of iron ore increased 13.9% in 1974 compared with 1973. Production of pig iron amounted to 7.9 million tons, a decline of less than 1% as compared with that of 1973. About 1.7 million tons of pig iron was imported.

Crude steel production in 1974 reached 14.6 million tons as compared with 14.1 million tons in 1973. Despite the increase, there were shortages of rolled steel products which required imports of about 2.3 million tons of rolled steel. In order to expand its steel industry in 1974, Poland continued to modernize the Lenin steel plant and began building a metallurgical works in Katowice. According to present plans, the Katowice plant is to produce 4.5 million tons of steel and 3.9 million tons of semifinished ferrous products in 1976.

In 1974 copper ore output amounted to 13.9 million tons, an increase of 1.3 million tons, or 10.3% as compared with that of 1973. Production of electrolytic copper amounted to 195,000 tons, an increase of 25% over the 1973 level. Copper and copper product manufacturing was being developed rapidly for export markets. During 1974 there were five copper mines in operation. The first stage of the Rudna copper mine, with an ultimate planned capacity of 7.5 million tons per year of copper ore, was put into operation in 1974.

The production of refined zinc was 233,000 tons, approximately the same as in 1973, and that of refined lead increased from 68,400 tons in 1973 to 71,600 in 1974, or by 4.7%. During 1974 there were seven operating lead-zinc mines in Poland. The new Pomorzany mine was put into operation during the year. This mine's planned production of 2.1 million tons per year of ore will not be reached until 1977. The initial output, however, resulted in an approximate 25% decrease in zinc concentrate imports.

In 1974 sulfur production reached 4.1 million tons, up 548,000 tons over that of 1973, largely due to the output from mines using the Frasch process.

Crude oil production was 550,000 tons in 1974 and could not meet national demand which required an additional 10.6 million tons of crude oil imports from the U.S.S.R. Poland also received 2.1 billion $m^3$ of Soviet gas in 1974. The production of electric power was 91.6 billion kilowatt-hours, an increase of 8.7% over that of 1973. In 1974, the country exported 4.5 billion kilowatt-hours and imported 1.7 billion kilowatt-hours of electric power.

**Table 1.—Poland: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Aluminum metal, primary | 102,000 | 102,000 | 102,000 |
| Cadmium metal, primary [e] | 350 | 350 | 350 |
| Copper: | | | |
| Mine output, metal content | 135,000 | 155,000 | 198,000 |
| Metal: | | | |
| Smelter | r134,000 | 155,000 | 195,000 |
| Refined including secondary | 131,000 | 156,000 | 195,000 |
| Iron and steel: | | | |
| Iron ore and concentrate, gross weight ____ thousand tons | 1,656 | 1,440 | 1,296 |
| Pig iron ____ do ____ | 7,830 | 7,926 | 7,916 |
| Ferroalloys: | | | |
| Blast furnace ____ do ____ | 132 | 129 | 133 |
| Electric furnace ____ do ____ | 175 | 158 | 157 |
| Steel, crude ____ do ____ | 13,476 | 14,057 | 14,566 |
| Steel, semimanufactures: | | | |
| Rolled, excluding pipe ____ do ____ | 9,215 | 9,867 | 10,558 |
| Pipe ____ do ____ | 933 | 1,012 | 1,101 |
| Lead: | | | |
| Mine output, metal content | 68,000 | 69,500 | [e] 70,000 |
| Metal, refined, including secondary | 65,300 | 68,400 | 71,600 |
| Nickel, mine output, metal content [e] | 1,500 | 1,500 | 2,000 |
| Silver, mine output, metal content [e] ____ thousand troy ounces | 4,000 | 4,800 | 6,100 |
| Zinc: | | | |
| Mine output, metal content | r 222,400 | 210,000 | 200,000 |
| Metal, refined, including secondary | 228,000 | 235,000 | 233,000 |

See footnotes at end of table.

## Table 1.—Poland: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| **NONMETALS** | | | | |
| Barite [e] | | 50,000 | 50,000 | 55,000 |
| Cement, hydraulic | thousand tons | 13,986 | 15,548 | 16,765 |
| Clays and clay products: | | | | |
| Crude clays, n.e.s.: | | | | |
| Bentonite [e] | do | 50 | 50 | 50 |
| Fire clay | do | 1,398 | 1,427 | 1,303 |
| Kaolin | do | 76 | 73 | 86 |
| Products | do | 805 | 825 | 820 |
| Feldspar [e] | do | 30 | 30 | 30 |
| Fertilizer materials, manufactured: | | | | |
| Nitrogenous: | | | | |
| Gross weight | thousand tons | 3,367 | 3,910 | 4,113 |
| Nitrogen content [2] | do | 1,147 | 1,365 | 1,457 |
| Phosphatic: | | | | |
| Gross weight | do | 2,934 | 2,890 | 2,737 |
| $P_2O_5$ content [2] | do | 763 | 814 | 823 |
| Gypsum and anhydrite: | | | | |
| Crude [e] | do | 850 | 850 | 850 |
| Calcined | do | 314 | 297 | 322 |
| Lime (quicklime and hydrated lime) | do | [r] 6,541 | 7,683 | 7,958 |
| Magnesite, crude | | 35,700 | 22,200 | 23,800 |
| Salt: | | | | |
| Rock | thousand tons | 1,209 | 1,260 | 1,405 |
| Other | do | 1,801 | 1,818 | 1,890 |
| Sodium and potassium compounds, n.e.s.: | | | | |
| Soda ash | do | 723 | 725 | 729 |
| Caustic soda | do | 335 | 338 | 361 |
| Stone, sand and gravel: | | | | |
| Stone: | | | | |
| Dolomite | do | 1,943 | 2,032 | 2,221 |
| Limestone | do | 9,800 | 10,300 | 8,400 |
| Marlstone | do | 107 | 90 | 78 |
| Quartzite | do | 83 | 97 | 163 |
| Other | do | 11,050 | 12,639 | 13,960 |
| Sand (for molding) | do | 397 | 533 | 503 |
| Sulfur: | | | | |
| Native: | | | | |
| Frasch [e] | do | 2,377 | 2,975 | 3,718 |
| Other than Frasch [e] | do | 550 | 570 | 375 |
| Total | do | 2,927 | 3,545 | 4,093 |
| Byproduct: | | | | |
| From metallurgy [e] | do | 234 | 239 | 262 |
| From petroleum [e] | do | 15 | 17 | 18 |
| Total | do | 249 | 256 | 280 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | |
| Coal: | | | | |
| Bituminous | do | 150,697 | 156,630 | 162,004 |
| Lignite and brown | do | 38,221 | 39,215 | 39,825 |
| Total | do | 188,918 | 195,845 | 201,829 |
| Coke: | | | | |
| Coke oven | do | [r] 15,827 | 16,465 | 16,973 |
| Gashouse | do | [r] 1,373 | 1,235 | 1,127 |
| Total | do | 17,200 | 17,700 | 18,100 |
| Fuel briquets, all grades | do | 1,984 | 1,796 | 1,789 |
| Gas: | | | | |
| Manufactured: | | | | |
| Town gas | million cubic feet | 29,594 | 26,627 | 23,590 |
| Coke oven gas | do | 215,560 | 225,695 | 233,499 |
| Natural, marketed | do | 205,637 | 212,840 | 202,670 |
| Natural gas liquids | thousand 42-gallon barrels | 303 | 360 | [e] 400 |
| Peat [e] | thousand tons | [r] 50 | [r] 40 | 40 |
| Petroleum: | | | | |
| Crude: | | | | |
| As reported | do | 347 | 392 | 550 |
| Converted | thousand 42-gallon barrels | 2,574 | 2,908 | 4,080 |
| Refinery products: | | | | |
| Gasoline | do | 18,071 | 18,607 | 17,578 |
| Kerosine (presumably including jet fuel) | do | 1,240 | 1,403 | 1,217 |
| Distillate fuel oil | do | 22,567 | 24,685 | 26,543 |

See footnotes at end of table.

Table 1.—Poland: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Petroleum—Continued | | | | |
| Refinery products—Continued | | | | |
| Residual fuel oil | thousand 42-gallon barrels | 19,900 | 22,511 | 21,419 |
| Lubricating oil | do | 2,597 | 2,744 | 2,744 |
| Grease | do | • 120 | 106 | • 100 |
| Paraffin | do | 118 | 205 | • 200 |
| Bitumen | do | 3,903 | 5,333 | • 5,500 |
| Total [3] | do | 68,516 | 75,594 | 75,301 |

• Estimate. [p] Preliminary. [r] Revised.
[1] In addition to the commodities listed, antimony, cobalt, germanium, gold, a variety of crude nonmetallic construction materials, and carbon black are also produced in Poland, but information is inadequate to make reliable estimates of output levels. Poland may also produce alumina in small quantities, but details on such an operation, if it exists, are not available.
[2] Includes content of multigradient fertilizers.
[3] Total of listed commodities only, excluding products not reported individually in official sources, as well as refinery fuel and losses.

## TRADE

Poland was a significant exporter of manufactured products, coal, and minerals in 1974. The main Polish imports were machinery, complete plant installations, semifinished products, natural gas, crude oil, and metallic ores.

In 1974 total exports were valued at Zl 27.6 billion, an increase of Zl 6.2 billion or 29% over that of 1973. The total value of Polish imports increased to Zl 36.1 billion, an increase of Zl 9.2 billion or 34% compared with the 1973 level.[4] The trade balance shows that the deficit increased from Zl 5.5 billion in 1973 to Zl 8.5 billion in 1974; an increase of 55%. Most of the deficit was incurred in trade with non-CMEA countries and was attributed to increased prices.

In 1974 exports of engineering and electrical industries products contributed 40% of the total national export value; coal, coke and electric power, 15%; chemical products, 11%; steel products and other metal products, 8%; and products of remaining industries, about 26%.[5] Fuel and electric power exports increased their share of the total export value from 14% in 1973 to 15% in 1974. The import value of manufacturing and electrical industries products accounted for 41%; steel products, 17%; chemical products, 13%; and petroleum and electric power for 4.5% of the total value of imports. Poland also imported iron ore, nonferrous metals or ores, zinc concentrates, alumina, and aluminum. The share of petroleum and electric power in total imports decreased from 7.6% in 1973 to 4.5% in 1974 and that of metals increased from 15% to 17%.

The CMEA countries' share of Polish exports declined from 61% in 1973 to 56% in 1974 and that of imports from 51% to 43% for the same period. Poland's largest trading partner among CMEA countries was the U.S.S.R. which in 1974 received 51% of the value of all Polish exports to the CMEA countries and supplied 51% of the value of all Polish imports from CMEA countries. Second most important trading partner was East Germany with 16% of the value of Polish exports and 17% of the total Polish import value. Czechoslovakia followed in third place accounting for 13% of Polish import and export values, while Hungary, Romania, and Bulgaria accounted for the balance of the CMEA region trade.

West Germany was Poland's most important trading partner among market economy countries. In 1974 it accounted for 17% of the value of all Polish exports and supplied 24% of the value of all Polish imports from these countries. The next ranking trading partners among market economy countries was the United Kingdom, followed by the United States, Italy, and France.

[4] Rynki Zagraniczne (Foreign Trade). August 1975, pp. 1–16.
[5] Bozyk, Pawel. The Economy of Modern Poland. Interpress Publishers, Warsaw, 1975, pp. 99–105.

## Table 2.—Poland: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum metal, including alloys, all forms | 28 | 681 | Mainly to Czechoslovakia. |
| Cadmium metal, all forms | 215 | 230 | Mainly to U.S.S.R. |
| Chromium trioxide | 826 | 422 | Spain 168; Italy 108; France 61. |
| Copper: | | | |
| Ore and concentrate | 2,302 | -- | |
| Metal unwrought and semimanufactures | r 55,966 | 49,459 | West Germany 15,560; Czechoslovakia 13,374; United Kingdom 11,532. |
| Iron and steel: | | | |
| Iron ore and concentrate | 1,000 | 2,000 | NA. |
| Scrap thousand tons | 435 | 525 | West Germany 127; Switzerland 127. |
| Pig iron [1] | 24,028 | 4,562 | All to Albania. |
| Ferroalloys [2] | 4,174 | 5,398 | West Germany 2,407; Austria 1,364. |
| Steel ingots | 62,127 | 6,464 | Hungary 4,010; East Germany 2,454. |
| Semimanufactures, including iron and steel castings thousand tons | r 1,399 | 1,382 | Romania 138; West Germany 116; Hungary 99. |
| Lead: | | | |
| Ore and concentrate | r 9,019 | 33,521 | Italy 15,637; France 9,570; Romania 5,568. |
| Metal including alloys, unwrought | 312 | 3,120 | United Kingdom 500; Netherlands 500. |
| Zinc metal, including alloys, unwrought and semimanufactures | r 100,700 | 95,600 | U.S.S.R. 40,589; United States 11,149. |
| Other metal, nonferrous semimanufactures including alloys | r 13,159 | 10,508 | U.S.S.R. 4,033; West Germany 2,042; Italy 1,310. |
| **NONMETALS** | | | |
| Cement | 26,752 | 26,653 | Czechoslovakia 11,799; Libya 5,658; Sweden 3,720. |
| Clay, refractory and burnt slate | r 52,169 | 41,188 | Hungary 19,003; Italy 11,885; East Germany 4,904. |
| Fertilizer materials, manufactured, nitrogenous thousand tons | 917 | 1,034 | East Germany 402; India 166. |
| Gypsum and plasters: | | | |
| Gypsum do | 532 | 564 | Sweden 178; Denmark 145; Norway 122. |
| Plasters do | 56 | 35 | West Germany 12; Austria 10; Hungary 7. |
| Lime | 76,212 | 57,049 | Mainly to Czechoslovakia. |
| Salt: | | | |
| Brine thousand tons | 53 | 54 | France 29; Czechoslovakia 10. |
| Rock salt | 191 | 166 | Hungary 37; Czechoslovakia 36; Finland 29. |
| Stone, dolomite | 19,431 | 27,287 | West Germany 14,684; Czechoslovakia 6,837; Denmark 5,766. |
| Sulfur: | | | |
| Elemental thousand tons | 2,487 | 2,865 | U.S.S.R. 449; West Germany 294; France 270. |
| Sulfuric acid do | 348 | 533 | Switzerland 211; West Germany 105; Czechoslovakia 76. |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Coal and briquets: | | | |
| Anthracite and bituminous thousand tons | 32,687 | 35,857 | U.S.S.R. 9,126; East Germany 3,822; Italy 3,009. |
| Lignite and lignite briquets do | 4,106 | 5,022 | All to East Germany. |
| Coke | 2,269 | 2,780 | East Germany 947; U.S.S.R. 664; Hungary 286. |
| Gas, manufactured coke oven million cubic feet | 138 | -- | |
| Petroleum refinery products thousand tons | 1,723 | 1,332 | U.S.S.R. 443; Austria 255; West Germany 177. |

r Revised. NA Not available.
[1] Includes blast furnace ferroalloys.
[2] Includes electric furnace ferroalloys only.

## Table 3.—Poland: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 116,370 | 125,228 | Hungary 112,574; Australia 12,634. |
| Oxide and hydroxide | 230,934 | 243,193 | Hungary 130,036; United States 71,925; Yugoslavia 27,022. |
| Metal including alloys, all forms | 24,828 | 22,811 | U.S.S.R. 6,742; Yugoslavia 4,051; Czechoslovakia 2,612. |
| Cadmium metal, all forms | 30 | -- | |
| Chromium, ore and concentrate | 169,324 | -- | |
| Copper metal including alloys, unwrought | | 175,140 | U.S.S.R. 120,282; Albania 36,254. |
| and semimanufactures | r 38,478 | 23,700 | United Kingdom 14,446; U.S.S.R. 5,028; Chile 3,550. |
| Iron and steel: | | | |
| Ore and concentrate thousand tons | 12,548 | 13,668 | U.S.S.R. 11,096; Sweden 1,427. |
| Scrap do | 302 | 198 | Mainly from Czechoslovakia. |
| Pig iron [1] do | 1,471 | 1,498 | Mainly from U.S.S.R. |
| Ferroalloys [2] do | 8 | 11 | U.S.S.R. 6; Austria 1; United Kingdom 1. |
| Steel ingots do | -- | 38 | West Germany 20; Czechoslovakia 12. |
| Semimanufactures including iron and steel castings do | 1,833 | 2,691 | West Germany 570; U.S.S.R. 570; Czechoslovakia 313. |
| Lead metal, including alloys, unwrought | 16,504 | 23,195 | Netherlands 7,597; U.S.S.R. 4,151; Yugoslavia 3,932. |
| Magnesium metal including alloys, all forms | 854 | 1,308 | All from U.S.S.R. |
| Manganese ore and concentrate | 505,463 | 525,448 | Mainly from U.S.S.R. |
| Mercury 76-pound flasks | r 5,918 | 5,279 | United Kingdom 1,508; Turkey 957; U.S.S.R. 841. |
| Molybdenum ore and concentrate | 354 | -- | |
| Tin metal including alloys, all forms long tons | 4,705 | 4,760 | United Kingdom 2,254; Indonesia 723. |
| Tungsten concentrate | 3,408 | 4,394 | United Kingdom 2,900; United States 649; People's Republic of China 502. |
| Zinc: | | | |
| Ore and concentrate | 160,889 | 125,555 | United States 44,843; Canada 19,748; Iran 14,831. |
| Metal including alloys, unwrought and semimanufactures | 359 | 1,025 | Norway 475; West Germany 456. |
| Other, nonferrous semimanufactures n.e.s | r 5,696 | 2,325 | West Germany 993; United Kingdom 452; Italy 242. |
| **NONMETALS** | | | |
| Asbestos | 70,520 | 83,883 | U.S.S.R. 63,066; United Kingdom 10,986. |
| Barite | 26,224 | 26,522 | Belgium 11,143; East Germany 9,996; India 2,905. |
| Cement thousand tons | 1,240 | 1,633 | Romania 471; U.S.S.R. 424; Sweden 244; Austria 178. |
| Clays, crude: | | | |
| Fuller's earth | 15,441 | 9,749 | Czechoslovakia 4,990; West Germany 2,225; Romania 1,685. |
| Kaolin (china clay) | 119,592 | 129,354 | Czechoslovakia 50,361; U.S.S.R. 38,713; United Kingdom 17,986. |
| Refractory clays and burnt slate | r 17,377 | 19,429 | Mainly from U.S.S.R. |
| Diatomite | 2,298 | 2,961 | United States 1,515; Belgium 1,122. |
| Fertilizer materials: | | | |
| Crude, phosphatic: | | | |
| Apatite concentrate thousand tons | 1,232 | 971 | All from U.S.S.R. |
| Phosphate rock do | 1,633 | 1,554 | Mainly from Morocco. |
| Manufactured: | | | |
| Nitrogenous do | 126 | 81 | All from U.S.S.R. |
| Phosphatic do | r 27 | -- | |
| Potassic do | 2,108 | 2,422 | Mainly from U.S.S.R. |
| Fluorspar | 39,849 | 36,132 | East Germany 23,919; People's Republic of China 11,561. |
| Graphite, natural | 13,030 | 9,224 | Austria 5,378; U.S.S.R. 2,642. |
| Gypsum, plasters | 2,503 | 3,436 | East Germany 1,884; West Germany 1,540. |
| Magnesite: | | | |
| Crude | 974 | 6,772 | Japan 5,436; U.S.S.R. 835. |
| Calcined | 170,382 | 144,326 | Czechoslovakia 60,324; North Korea 53,118; Yugoslavia 15,982. |
| Mica | 1,666 | 1,848 | All from India. |

See footnotes at end of table.

Table 3.—Poland: Imports of selected mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone: | | | |
| Dolomite | 7,618 | 12,290 | Hungary 8,328; Romania 3,650. |
| Quartz | 2,886 | 2,075 | Austria 1,104; Norway 863. |
| Quartzite | 19,885 | 10,208 | All from U.S.S.R. |
| Other | 14,783 | 15,842 | Norway 11,021; Finland 2,700. |
| Talc | 19,119 | 23,630 | North Korea 11,454; Czechoslovakia 4,309. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal and briquets: | | | |
| Anthracite and bituminous coal thousand tons | 1,194 | 1,195 | U.S.S.R. 857; East Germany 300. |
| Lignite and lignite briquets do | 2 | -- | |
| Gas, hydrocarbon: | | | |
| Natural million cubic feet | 52,972 | 60,388 | All from U.S.S.R. |
| Manufactured do | 176 | 189 | All from East Germany. |
| Petroleum: | | | |
| Crude thousand tons | 9,703 | 11,140 | Mainly from U.S.S.R. |
| Refinery products do | 2,332 | 3,079 | U.S.S.R. 1,334; United Kingdom 410. |

r Revised.
1 Includes blast furnace ferroalloys.
2 Includes electric furnace ferroalloys only.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Production of aluminum in Poland totaled 102,000 tons in 1974, and has maintained the same approximate level for several years. The lack of aluminum raw material reserves created a dependence on imports of bauxite and alumina. Alumina imports during 1974 totaled 263,000 tons, representing an increase of 20,000 tons, or 8.2% over the 1973 level. The situation will not improve until 1978, when the production of alumina, by the Grzymek process, is to begin at Nowing, near Kielce. The plant under construction there is to produce 103,000 tons of alumina per year.[6]

Primary reduction plants in the Skawina and Konin Basins are the principal aluminum production centers in Poland. Because of raw materials shortages, Poland signed a 10-year agreement with Yugoslavia for delivery of 1.2 million tons of alumina in the period from 1976 to 1985. Alumina is also imported from the United States, while bauxite is imported from Hungary and West Germany.

**Copper.**—Poland, a major world copper producer, fulfilled the 5-year plan for copper mining and refining in 4 years. The plan provided for 180,000 tons of electrolytic copper to be produced in 1975, but the actual output was 195,000 tons in 1974, a 25% increase over that of 1973. It is expected that in 1975 the copper plants will deliver 235,000 tons of electrolytic copper,[7] and by 1980 production is to reach 425,000 tons. Production of crude copper ores totaled 13.9 million tons in 1974, an increase of 1.3 million tons or 10.7% over that of 1973. It is anticipated that the output of crude copper ore in 1975 will reach 17 million tons, 2.5 times as much as in 1971.

In 1974 Poland exported 58,000 tons of copper, 8,540 tons more than in 1973, an increase of 17.3%. Exports of copper to CMEA countries declined in 1974, but deliveries to market economy countries increased. Imports of copper decreased from 23,700 tons in 1973 to 10,400 tons in 1974. Nearly 80% of these imports came from non-CMEA countries.

Over the past 15 years Poland invested approximately Zl 40 billion[8] in the development of the Lubin-Glogów copper basin, consisting of three mines (the Polkowice, Lubin, and Rudna) and two copper smelting-refining works (Legnica and Glogów). The Polkowice and Lubin mines have already attained full production capacity of 4.5 million tons of ore per year. The first stage of the third mine, Rudna, the biggest and most modern copper mine in the country, started operating in June 1974, with a planned capacity, when all stages are com-

[6] Kurier Polski (Polish Courier). Warsaw, Sept. 11, 1975, p. 2.
[7] Zycie Gospodarcze (Economic Life). Warsaw, Apr. 27, 1975, p. 5.
[8] Zolnierz Wolnosci (Soldier of Freedom). Warsaw, Nov. 6, 1975, p. 4.

pleted, of 7.5 million tons per year. It is expected that 50% of this will be achieved in 1975.

The two plants in operation, one at Legnica and the other at Glogów, were completely integrated from smelting to electrolytic refining. The Legnica plant, originally designed for 25,000 tons per year of production capacity, after modernization was producing 70,000 tons of electrolytic copper per year. In 1977 the Legnica plant will supply approximately 100,000 tons of electrolytic copper per year.

The Glogów I copper plant is being modernized to produce 160,000 tons per year. Two production sections already were in operation and design capacity is to be achieved during the second quarter of 1975. When construction of Glogów II is completed, it is estimated that its production will be 150,000 tons of copper per year. The Glogów II plant is to be put into operation by yearend 1976. The next planned project of this type is to be located at Orsk, near Lubin.

The largest deposits of copper in Poland were discovered in 1957, and as a result of this discovery Poland ranks eighth in the world in copper ore reserves.

**Iron and Steel.**—In 1974 Poland produced 14.6 million tons[9] of crude steel, which was equal to 2% of world steel output. Production of pig iron increased 53,000 tons over the 1973 level, crude steel increased 509,000 tons, rolled products 691,000 tons, and steel pipes 89,000 tons. The plan for the next 5-year period calls for the production of 22 million tons of crude steel in 1980.[10]

Poland's steel industry development plans are expected to reduce the need to import pig iron and steel products, although the industry is to remain heavily dependent on imported iron ore. Imports of pig iron, in 1974, reached 1.7 million tons, an increase of 202,000 tons over the 1973 level. Steel product imports are also significant imports, because the country, as yet, has been unable to produce the variety of rolled steel products required. Polish imports of rolled products increased in 1974 to 2.3 million tons, an increase of 500,000 tons (27%) over that of 1973. Some 1.32 million tons of rolled products were exported, an increase of 11.9% over that of 1973. Exports of steel pipe at 30,500 tons, decreased by 24.9% for the same period. This was due to the strong demand for steel pipe at home. In 1976 exports of steel products is to increase again when the first stage of the Katowice steel plant will be completed.

Polish reports do not assess the overall technical level of the nation's steel industry.[11] Although many plants and shops measure up to high modern standards of world technology, Poland still has many old-fashioned steel plants mindful of the 19th century, but these are being phased out as modernization and expansion activities continue in major iron and steel plants in the country.

One of the biggest metallurgical plants in Kracow, the Lenin Metallurgical Plant, which produced 6.30 million tons of steel in 1973, and 6.75 million tons in 1974, is now being expanded. A new sheet rolling mill for automobile bodies was started in 1972, and in 1974 additional rolling and sheet metal processing equipment imported from Japan and France was installed. Japanese and Polish computers and computer components were also installed for automatic control of the production process. The second stage of the plate rolling mill at the Beirut Steel Works, in Czestnochow, with a production capacity of over 700,000 tons per year of plate, mainly for the shipbuilding industry, was completed in 1974.

Construction of the new metallurgical plant at Katowice continued in 1974. Production at this plant was scheduled to begin in 1976, with an output of 4.5 million tons of steel and 3.9 million tons of semifinished metallurgical products.[12] The plant's oxygen converters, with a capacity of 350 tons of steel each, will be three times larger than the units now in operation at the Lenin steel works. The total cost of plant construction is estimated at Zl 34 billion; some 15 billion zlotys have already been invested, including Zl 4.2 billion invested in 1974.

The Polish steel industry is almost entirely dependent upon imported iron ore, of which 15.6 million tons was purchased in 1974. Imports of iron ore increased in 1974 by 1.9 million tons, or 13.9% in comparison with the 1973 level. The U.S.S.R. has for many years been the chief source of iron ore for Poland. Approximately 85%

[9] Concise Statistical Yearbook of Poland. Warsaw, 1975, p. 94.
[10] Zolnier Wolnosci (Soldier of Freedom). Warsaw, Nov. 25, 1975, p. 4.
[11] Zycie Gospodarcze (Economic Life). Warsaw, Mar. 3, 1974, pp. 1, 2.
[12] Trybuna Ludu. Warsaw, May 22, 1975, pp. 1, 4.

of the iron ore imported comes from the U.S.S.R. and about 15% from Sweden, Brazil, East Germany, and Czechoslovakia. Domestic production of iron ore has decreased from year to year. Output from 1970 to 1973 decreased by 44% and during 1974 by 9.7%. Therefore, imports of iron ore can be expected to increase considerably, particularly when the Katowice steelworks has been completed. Poland's principal iron ore deposits are located in the Swietokryzyskie Mountains, northeast of Krakow, but the deposits are of low grade and cannot supply more than a fraction of national requirements.

**Lead and Zinc.**—Poland produced 233,000 tons of refined zinc and 71,600 tons of refined lead in 1974. Production of zinc declined by about 1%, but lead production increased by 4.7% compared with 1973 levels.

Poland has long been one of the largest zinc-producing countries in the world. A zinc smelting plant was recently completed at Miasteczko Slaskie. Production of zinc is expected to increase to 237,000 tons in 1975 and to 260,000 tons by 1980. Production of lead is expected to be 74,000 tons in 1975 and 120,000 tons in 1980.

In 1974 Poland produced 4.15 million tons of crude lead-zinc ores (1.7% over that of 1973). Deposits of lead-zinc ore occur in several regions, but mine production is being developed in the Olkusz region, which has the largest reserves. During 1974 the new Pomorzany underground mine, near Olkusz, started production of lead-zinc ore. The mine, with a concentration plant, is part of the Boleslaw mining and metallurgical complex at Bulowina. In approximately 3 years, the mine is expected to produce 2.1 million tons of ore per year.[13]

Zinc is one of the traditional commodities exported by Poland. In 1974 exports of zinc and zinc-rolled products declined by 4.9% from 95,600 tons in 1973 to 90,900 tons in 1974. Imports of zinc concentrates decreased from 126,000 tons in 1973 to 95,200 tons in 1974. This may be attributed to the startup of the Pomorzany mine.

## NONMETALS

**Fertilizer Materials.**—In terms of nutrient content, Poland produced 1.46 million tons of nitrogen and 823,000 tons of phosphatic fertilizers in 1974. Production of nitrogen fertilizers increased 6.7% as compared with 1973, but phosphatic fertilizer production remained at approximately the same level as in 1973. Total output of nitrogen fertilizer in 1975 was planned to reach 1.9 million tons, and of phosphatic fertilizers, 1.0 million tons. The goals for 1980 are at 2.2 and 1.3 million tons, respectively.[14]

The amount of nitrogen fertilizer exported in 1974 in terms of nutrient content declined by 4.3% in comparison to 1973, to a level of 384,200 tons.[15] At present, Poland's exports of nitrogen fertilizers are heavily dependent on urea, the product being sold mainly to developing countries. Productive capacity for this compound has risen fast, and the new Police plant (for which major expansion plans have been announced) could soon become a major source of fertilizers in Polish foreign trade. In terms of nutrient content, the amount of phosphorites and apatites imported in 1974 increased 9.9% compared with the 1973 level.

There were five main fertilizer plants in operation in 1974: The Chorzów, Tornow, Kedzierzyn, Pulawy and Wloclawek works. Phosphate fertilizers were produced at: Wroclaw, Kraków, Szczecin, Ubocz, Bogus, Zowice, Tarnobrzey, and Gdansk.

In 1974 the 440,000-ton-per-year compound fertilizer plant at Police was completed. An ammonia plant, with a capacity of around 496,000-ton-per-year, and a 396,000-ton-per-year urea plant, are also planned for the site. The Kedzierzyn and Pulawy ammonia plants are also being considered for further expansion. Expansion is already underway at the Kedzierzyn plant, where the capacity was reported at 440,000 tons per year. Pulawy is Poland's largest ammonia-producing plant, with a capacity of 1 million tons per year.[16]

The use of mineral fertilizers per hectare of land in Poland has increased over the past few years. In 1974 consumption of fertilizer per hectare of area was reported as 173.6 kilograms compared with 157.6 kilograms in 1973.

**Sulfur.**—In 1974 Poland produced a total of 4.1 million tons of native sulfur, an increase of 540,000 tons, or 15% more than the 3.5 million tons produced during

[13] Zycie Gospodarcze (Economic Life). Warsaw, No. 50, Dec. 14, 1975, p. 7.
[14] Nitrogen. London, No. 96, July/August 1975, p. 10.
[15] Pages 1–16 of work cited in footnote 4.
[16] Nitrogen. London, No. 95, May/June 1975.

1973. It was anticipated that total capacity of sulfur production would increase to 4.6 million to 4.9 million tons in 1975, as a result of increased output at the Jeziorek and possibly also the Machow mines.[17] In 1975 Poland will be able to begin development of a new sulfur deposit in the eastern part of the Rzeszow region. It was anticipated that total productive capacity could increase to 6 million tons per year by 1976 or 1977.[18]

Polish sulfur is surface mined at the Piaseczno and Machow operations while the Frasch process is used at the Grzybow and Jeziorko mines. In 1974 85% of the sulfur used in Poland was for the production of sulfuric acid; 5.9% was used by the petroleum industry; 3.6% in production of fertilizers; 3%, in the paper industry; and 4%, in the rubber industry. Poland accounted for 3% of the world's production of sulfuric acid in 1974.

Poland is the world's second largest exporter of sulfur, after Canada. Exports of sulfur reached 3.02 million tons in 1974, an increase of 5.2% in terms of quantity and 54% in terms value compared with 1973.[19] Approximately 2 million tons of sulfur was exported to non-CMEA countries. Sulfur prices in non-CMEA countries increased by 80.7% in 1974. Polish sulfur was sold and shipped in four different forms: as mined, liquid, granulated, and ground. The chief buyers among market economy countries were Norway, Austria, Italy, Finland, the United Kingdom, and India. Exports of large amounts of liquid sulfur require renting of terminal facilities for handling at destination. Such facilities are now operating at Rumcon, United Kingdom, 30,000 tons capacity; at Rotterdam, the Netherlands, 20,000 tons capacity; and at Rouen, France, 20,000 tons capacity.

## MINERAL FUELS

For many years coal, including lignite, has been the major source of primary energy in Poland. Production of primary energy derived from fossil fuels, fuelwood, and hydroelectric generation increased from 180.1 million tons standard coal equivalent in 1973 to 185.1 million tons in 1974.

In 1974 the share of coal in total primary energy production increased to 93.9% from 93.7% in 1973. During the same period the share of petroleum increased from 0.3% to 0.4%, while that of natural gas declined from 4.5% to 4.1%. Total consumption of all types of primary energy increased from 162.8 million tons of standard fuel equivalent in 1973, to 163.1 in 1974. The primary energy balance for 1973 and 1974 is shown in table 4.

In 1974 Poland produced 91.6 billion kilowatt-hours of electricity, up from 84.3 billion kilowatt-hours in 1973, an increase of 8.7%.[20] The installed capacity of electric powerplants was 19,130 megawatts in 1974, up from 17,730 megawatts in 1973, or an increase of 7.9%.[21] During 1974 about 4.5 billion kilowatt-hours of electricity was ex-

**Table 4.—Poland: Total primary energy balance for 1973 and 1974**
(Million tons of standard equivalent) [1]

| | Total primary energy | Coal (lignite, anthracite, bituminous) and coke | Crude oil and petroleum products | Natural gas | Others (peat, wood, hydropower) |
|---|---|---|---|---|---|
| 1973 | | | | | |
| Production | 180.1 | 168.8 | 0.57 | 8.03 | 2.70 |
| Exports | 41.95 | 39.9 | 2.05 | -- | -- |
| Imports | 24.6 | 1.2 | 21.12 | 2.28 | -- |
| Apparent consumption | 162.8 | 130.1 | 19.64 | 10.31 | 2.70 |
| 1974 | | | | | |
| Production | 185.1 | 173.9 | .81 | 7.65 | 2.78 |
| Exports | 46.2 | 44.4 | 1.82 | -- | -- |
| Imports | 24.2 | 1.2 | 20.2 | 2.82 | -- |
| Apparent consumption | 163.1 | 130.7 | 19.19 | 10.47 | 2.78 |

[1] Conversion factors used are hard coal, 1.0; brown coal, 0.3; coke, 0.9; crude oil 1.54; natural gas, (1,000 cubic meters), 1.33; hydroelectric power (1,000 kilowatt-hours), 0.125.

Source: World Energy Supplies, Statistical Papers. Series J, No. 18, (United Nations) New York, 1975.

[17] Sulphur. London, No. 118, May/June 1975, p. 5.
[18] Sulphur, London. No. 116, January/February 1975, p. 14.
[19] Pages 1–16 of work cited in footnote 4.
[20] Page 116 of work cited in footnote 9.
[21] Work cited in footnote 9.

ported and 1.7 billion kilowatt-hours imported.[22]

Poland's electric powerstations were fueled mainly by coal in 1974: 70% of the electric power generated came from hard coal; 27% from brown coal; and about 3% was derived from oil-fueled and hydroelectric powerstations. In the future, the demand for electric power is expected to increase between 8% to 9% per year. Output of electric power may reach 97 billion kilowatt-hours in 1975, increasing to about 133 billion kilowatt-hours in 1980.[23]

In 1974 a total of 1,500 megawatts of new electric power units were commissioned; 6 units of 200 megawatts each (Rybnik, Patnow, Dolna Odra and Kozienice) and 2 units of 150 megawatts each (Sekoerk, Lodz).[24] The construction of the first nuclear powerplant is to begin in the late 1970's and the entire project is to be completed in 1987.[25]

**Coal.**—During 1974 Poland produced a total of 162 million tons of hard coal, an increase of 5.4 million tons, or 3.4% over that of 1973. Coal production in 1975 is expected to reach 171 million tons, increasing to 190 million to 195 million tons by 1980.

Poland is the second largest exporter of coal in the world. Total exports of hard coal increased from 35.9 million tons in 1973 to 40.1 million tons in 1974, an increase of 4.2 million or 11.7%. In 1974 Poland exported coal to 31 countries. The U.S.S.R. was the largest importer of hard coal from Poland, with a total of 9.5 million tons. All other CMEA countries accounted for 5.6 million tons. Non-CMEA countries imported 25 million tons of coal from Poland in 1974.

Poland is one of the largest producers of brown coal, which is used mainly by local elelctric powerstations. Brown coal (lignite) production increased from 39.2 million tons in 1973 to 39.8 million tons in 1974, an increase of 1.5%. The trend is expected to continue in the future. In 1974 about 5.2 million tons of brown coal was exported, 4% over that of 1973. The principal importers of brown coal were Bulgaria, Yugoslavia, India, East Germany, and Romania.

Production of coke reached 18.1 million tons in 1974, a 2.3% increase over that of 1973, and it was expected that in 1975 it will reach 18.4 million tons.[26] Coke exports during 1974 totaled 3.0 million tons, an increase of 220,000 tons, or 7.9% over the 1973 level. Coke is gradually becoming less important on Poland's export list. In 1974 East European countries received approximately 15% of the coke exported from Poland, while Western countries received about 75%.

Hard coal is located in three basins: the Upper Silesian, Lower Silesian, and Lublin. Lignite is in the central and western parts of the country. The Upper Silesian Basin produced about 97% of the total coal output in 1974. During the past 30 years, 41 coal mines have been expanded and modernized, and 14 new big mines have been developed for exploitation. Two more mines, Slask (west of Katowice) and Pniowek (south of Katowice in the Pszczyna District), were commissioned in December 1974. The Slask mine, initially producing 1,500 tons per day, is expected to reach an output of 7,000 tons per day in 1978. The Pniowek mine produced about 100,000 tons of coking coal in 1974. The final plans for the development of the Lublin and Belchatow Basins will be made in the near future.[27]

The Lublin coal basin covers the territory between the Bug and Wieprz Rivers (eastern part of the country near Lublin). It contains high-energy coal at a depth of 600 to 1,000 meters. It was estimated that the first load of coal from the first mine, near the Bogdanka Village, would be obtained in 1977. In 1990 the development of the first stage of the Lublin Basin is to be completed, with four mines producing approximately 25 million tons of hard coal per year.

The total reserves of hard coal in the three coal basins (Upper Silesia, Lower Silesia and Lublin) to a depth of 1,000 meters) totaled 100 billion tons. About 40.5 billion tons of total reserves are located in Lublin Voivodship.[28]

The Belchatow brown coal region is located in Central Poland; the Belchatow brown coal-energy complex will be the greatest project of the current 5-year plan, and it is to be commissioned in 1980. Bel-

[22] Page 117 of work cited in footnote 9.
[23] Trybuna Ludu. Warsaw, Feb. 13, 1976.
[24] Trojanowski, Jerry. Wykonanic plano energetyki zawodowe W. 1974r. i plan na 1975r. (Fulfillment of plan by energetic industry in 1974 and plan for 1975). Energetyka 1975, 29, No. 5, pp. 145–146.
[25] Page 37 of work cited in footnote 5.
[26] United Nations Economic and Social Council, New York, coal/WP. 1/R. 25/Add.2, Dec. 10. 1975.
[27] Zycie Gospodarcze (Economic Life). Warsaw, Mar. 16, 1975, p. 1.
[28] Page 2 of work cited in footnote 27.

chatow is to have an annual capacity of 40 million tons per year when it is fully developed and, together with Szczercow mines in the same region, the total output will approach 50 million tons.[29] Belchatow's brown coal reserves are said to total 1,250 million tons, and those of the Szczercow Field, an additional 870 million tons.

**Natural Gas.**—Extraction of gas in 1974 was 5.7 billion cubic meters, a decrease of 4.8% compared with that of 1973. Imports of natural gas from the U.S.S.R. totaled 2.1 billion cubic meters, a 24% increase compared with those in 1973. Most of the domestic natural gas consumed in Poland was extracted from the Lubaszow Field. When the Orenburg-Eastern Europe gas pipeline is completed and put into operation in 1978, Poland is to receive an additional 2.8 billion cubic meters per year from the U.S.S.R.[30] Construction of this pipeline is to start in 1975.[31]

**Petroleum.**—Production of crude oil in Poland is relatively insignificant. In 1974 the output amounted to 550,000 tons, an increase of 158,000 tons, or 40% over that of 1973. It is expected that the output of crude oil in 1975 will be approximately 700,000 tons. About 11 million tons of crude oil was imported (mainly from the U.S.S.R.) in 1974, a decrease of 4.5% compared with that of 1973. Some 146,000 tons of crude oil was imported from countries other than the U.S.S.R. (mainly from Iran). According to Polish sources, 13 million tons of crude oil will be imported in 1975.[32] In 1974 Poland exported 1.2 million tons of petroleum products and synthetic fuels, which is 11% less than that of the 1973 year. For the same period, imports of petroleum products (automotive fuel, lubricants) have declined from 3.08 million tons in 1973 to 3.02 million tons in 1974, as the Plock refinery was completed and came into production.

Poland has signed an agreement to participate in the construction of pipelines in Byelorussia of the U.S.S.R. This agreement provides for construction of an oil pipeline from Polotsk, in the U.S.S.R., to Poland, and it is expected that it will be completed by yearend 1976.[33] In payment for the construction of this pipeline, Poland will receive additional deliveries of approximately 1 million tons of crude oil yearly, for 20 years, beginning in 1977.

In 1974 the Plock refinery, together with several smaller plants, produced approximately 11.4 million tons of refined petroleum, which by world standards is not a large amount. The Plock refinery is to attain a capacity of 13 million tons of crude oil input in 1975.

In 1975 the first stage of construction of the Gdansk refinery is to be completed, and is expected to produce 3 million tons of petroleum products per year. Completion of the second stage of the plant is expected sometime in 1977; at the same time, construction of refineries in Poznan, Czechowice and Blachownia Slaske will also continue. The first section of the Blachownia refinery is expected to start operating in 1978, with an anticipated production of 3 million tons per year of petroleum products. The Czechowice refinery will concentrate on the production of fuel oils and lubricants, while the Blachownia refinery will gradually become transformed into a petrochemical complex. The Polish petroleum industry is generally concentrated in a narrow belt along the Carpathians.[34] Intensified exploration has resulted in the discovery of new crude oil fields in the Portynia region. In the Carpathians crude oil fields have been expanded in the regions of Weglowka and Osobnica, and some new fields have been discovered in the Carpathian Foreland around Bszezowki and Grobla, as well as in the lowlands of Poland, known as the Pomorsko and Maszewo regions.

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[29] Slowo Powszechney (Daily Word). Dec. 4, 1975.
[30] Zycie Gospodarcze (Economic Life). Warsaw, Apr. 20, p. 13.
[31] Page 12 of work cited in footnote 30.
[32] Zycie Warszawy (Warsaw's Life). Warsaw, May 10, 1974, pp. 1, 6.
[33] Trybuna Ludu. Warsaw, April 18, 1975.
[34] Polish Mining Industry. Slask Publishers, Katowice, Poland, 1974.

# The Mineral Industry of Portugal

By Norman A. Matthews [1]

The Portuguese mineral and metal industries produced lower tonnages overall in 1974 compared with those of 1973, although the value was substantially greater because of higher prices. The total tonnage produced in 1974, of 20 mineral commodities for which data were available, quarterly was 1,299,390, compared with 1,368,150 in 1973; relative values were $34.0 million [2] in 1974, and $21.7 million in 1973. Political unrest during most of the year impeded reporting of new mineral resource developments and delayed statistical compilations.

Portugal functioned with interim governments during most of the year; policies were directed at nationalization of service industries and major segments of the manufacturing industry, land reform aimed at increased agricultural production, and redistribution of revenue from the productive capacity of the nation. Principles were elucidated and debated but implementation was not consummated to sustain an overall national effort to improve the standard of living and balance of payments. Tourism declined over 31%, and remittances by emigrant workers declined 50% when compared with that of 1973. At the same time, the imbalance between value of imports and exports increased to such a degree that foreign currency reserves declined 14% during 1974. Value of exports increased to $2.26 billion in 1974, representing a 28% increase compared with 1973, whereas value of imports increased to $4.46 billion, an increase of 41% compared with 1973.

During 1974, minimum wage legislation was instituted which provides substantial wage increases to 50% of the nation's workers. Parallel increase in salary wages plus the increased cost of imported food staples resulted in inflation of 25% to 30%. Unemployment increased from a negligible level early in the year to 4% in the last quarter as many emigrant workers returned because of recessions in the more northerly European countries. A further increase in unemployment was expected when Portuguese nationals returned from Mozambique and Angola and overseas Portuguese troops returned and were demobilized. Irrespective of these considerations, the Government's major problem involved increasing productivity in the country so that it can sustain internal growth and increase exports to pay for the high-technology items that Portugal must continue to import.

## PRODUCTION

Overall value of the principal mineral commodities produced increased 57% because of higher prices in 1974, compared with that of 1973; tonnage of the same commodities declined overall and production of some commodities, was not reported in 1974. Production of 230,210 tons of anthracite coal represented an increase of 4%, compared with that of 1973. Copper mine output of 1,949 tons of ore and concentrate remained similar to that produced in 1973, whereas the tonnage of tin concentrate (618 long tons) declined 7%. Production of tungsten concentrate, a significant item of Portugal's mineral export trade, included 2,393 tons of wolfra-

[1] Physical scientist, Division of Ferrous Metals.
[2] Where necessary, values have been converted from Escudos (Esc) to U.S. dollars at the rate of Ecs25.41=US$1.00.

mite concentrate and 149 tons of scheelite concentrate, 2% lower than comparable combined 1973 figures. In contrast, the quantity of ferrotungsten produced increased modestly to 369 tons in 1974. Refined copper production increased to 2,519 tons in 1974, whereas secondary aluminum production declined to 1,557 tons.

Production of hematite ore increased substantially in 1974; production of manganiferous iron ore (42% iron and 7.4% manganese) was 24,450 tons, a decline of 46% from that of 1973. Steel production declined substantially irrespective of increased demand, apparently because of labor strife which reduced production to one-third of the normal monthly level from August through October. Production of iron ore sinter declined 22% to 243,285 tons, pig iron 27% to 252,000 tons, and steel ingots 9% to 376,000 tons, when compared with that of 1973. Production of wrought steel products totaled 424,444 tons, partly from imported slabs and other semifinished items, compared with 509,271 tons in 1973. Ferrous casting production totaled 80,482 tons in 1974, a modest increase over that produced in 1973.

At yearend, production of electrical energy was by hydroelectric plants (82%) and thermal plants (18%). Also, additional personnel were alloted to increase coal production, and production of hematite iron ore was resumed at a higher rate than had been achieved in recent years.

In the nonmetallic minerals area, production of most commodities in 1974 was at levels similar with those of 1973, as the following relative tonnages indicate (1973 figures in parentheses): washed clay 27,214 (22,698); raw clay 23,979 (21,856); rock salt 620,000 (605,000); cupriferous pyrites 510,571 (532,401); barite 1,489 (1,458); diatomite 1,933 (1,153); feldspar 29,900 (24,018); quartzite 181,000 (173,000); and talc 1,170 (1,110). Production of hydraulic cement in 1974, 3,295,000 tons, was approximately equal to the record quantity produced in 1973. Sand and gravel data production continued at high levels.

Production of fertilizer materials in 1974 totaled 1,075,000 tons, a 4% increase over production in 1973. Production of inorganic industrial chemicals declined overall in 1974, as exemplified by—sulfuric acid 340,111 tons (a decline of 5%), nitric acid 165,939 tons (a decline of 32%), and hydrochloric acid 36,075 tons (a decline of 9%). Production of other classes of materials, such as tile and brick for construction and resins for plastics manufacture, also declined in 1974, compared with production in 1973. Production of petroleum products in 1974 totaled 4,534,706 tons, a 14% increase over that produced in 1973, with the increase principally in gasoline and fuel oil fractions.

**Table 1.—Portugal: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| METALS | | | |
| Antimony, mine output, metal content | 14 | 29 | -- |
| Arsenic, white | 261 | 362 | 263 |
| Beryl concentrate, gross weight | 17 | 3 | 15 |
| Columbite-tantalite concentrate, gross weight | 12 | 12 | 9 |
| Copper: | | | |
| Mine output, metal content: | | | |
| In cupreous pyrite | 5,528 | 5,324 | 4,595 |
| In other ore and concentrate | r 543 | 651 | 568 |
| In precipitate | 30 | 14 | 16 |
| Total | r 6,101 | 5,989 | 5,179 |
| Metal: | | | |
| Smelter | 3,800 | 4,000 | 4,000 |
| Refined, primary | 1,805 | 2,314 | 2,519 |
| Gold, mine output, metal content ------ troy ounces | 16,718 | 14,661 | 11,478 |
| Iron and steel: | | | |
| Iron ore and concentrate, gross weight: | | | |
| Hematite | 686 | 11,188 | 28,498 |
| Manganiferous | 42,140 | 45,550 | 24,450 |
| Total | 42,826 | 56,738 | 52,948 |
| Pig iron ---------- thousand tons | r 364 | 347 | 252 |

See footnotes at end of table.

## Table 1.—Portugal: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Ferroalloys: | | | |
| Ferrotungsten | 336 | 331 | 369 |
| Other | 12,664 | 5,365 | 11,362 |
| Total | r 13,000 | 5,696 | 11,731 |
| Steel, crude thousand tons | r 431 | 459 | 376 |
| Steel semimanufactures do | 446 | 408 | 329 |
| Lead: | | | |
| Mine output, metal content | 1,157 | 452 | 500 |
| Metal, refined | 1,200 | 1,000 | 1,100 |
| Manganese ore and concentrate, gross weight | 5,348 | 187 | 71 |
| Molybdenum ore and concentrate, metal content | 2 | e 2 | (1) |
| Silver, mine output, metal content troy ounces | 230,263 | 125,838 | 23,888 |
| Tin: | | | |
| Mine output, metal content long tons | 520 | 508 | 417 |
| Metal do | 596 | 516 | 443 |
| Titanium, ilmenite concentrate, gross weight | 752 | 610 | 274 |
| Tungsten, mine output, metal content | 1,403 | 1,547 | 1,468 |
| Uranium oxide ($U_3O_8$) e | 95 | 95 | 95 |
| Zinc, mine output, metal content | 1,788 | 698 | 1,600 |
| NONMETALS | | | |
| Asbestos | 8 | e 130 | 180 |
| Barite | 825 | 1,458 | 1,489 |
| Cement, hydraulic 2 thousand tons | r 2,780 | 3,301 | 3,295 |
| Clays: | | | |
| Kaolin | 44,636 | 44,554 | 49,639 |
| Other | 72,917 | 77,510 | 121,916 |
| Diatomite | 1,651 | 1,153 | 1,933 |
| Feldspar | 18,011 | 24,018 | 29,900 |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous, gross weight thousand tons | r 528 | 517 | 586 |
| Phosphatic, gross weight do | r 186 | 216 | 216 |
| Mixed and unspecified do | r 287 | 304 | 273 |
| Total do | r 1,001 | 1,037 | 1,075 |
| Gypsum and anhydrite | 135,496 | 99,839 | 143,039 |
| Kyanite and related materials, andalusite | 103 | 100 | 50 |
| Lime (quicklime and hydrated lime) thousand tons | r 290 | 253 | 219 |
| Lithium minerals, lepidolite | 1,200 | 1,200 | 1,200 |
| Mica, all grades | 1,656 | e 1,700 | -- |
| Pyrite and pyrrhotite (including cupreous): | | | |
| Gross weight thousand tons | 553 | 532 | 511 |
| Sulfur content do | 243 | 234 | 225 |
| Salt: | | | |
| Rock do | 286 | 605 | 620 |
| Marine do | 212 | 221 | 223 |
| Total do | 498 | 826 | 843 |
| Sand and gravel: | | | |
| Gravel do | 314 | 411 | 328 |
| Sand do | 2,647 | 5,256 | 4,497 |
| Stone: | | | |
| Calcareous: | | | |
| Dolomite do | 34 | 55 | 84 |
| Limestone, marl and calcite do | 6,939 | 6,636 | 8,125 |
| Marble do | 236 | 284 | 309 |
| Other: | | | |
| Basalt do | 54 | 39 | 32 |
| Diorite do | 51 | 36 | 3,337 |
| Gabbro do | 22 | 4 | 1 |
| Granite do | 2,756 | 4,733 | 4,576 |
| Grawacke do | 30 | 29 | 49 |
| Ophite do | 40 | 47 | 88 |
| Porphyry do | 91 | 57 | 109 |
| Quartz do | 170 | 163 | 141 |
| Quartzite do | 115 | 173 | 181 |
| Schist do | 177 | 209 | 209 |
| Serpentine | 445 | 720 | 584 |
| Slate thousand tons | 45 | 77 | 49 |
| Syenite do | 4 | 6 | 6 |
| Sulfur, elemental, including sublimed | 2,906 | 3,147 | 532 |
| Talc | 1,204 | 1,110 | 1,170 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal, anthracite thousand tons | 252 | 221 | 230 |
| Coke, metallurgical do | 161 | 269 | 196 |
| Fuel briquets, all grades do | r 35 | 34 | 5 |
| Gas, manufactured million cubic feet | r 12,854 | 15,185 | 12,996 |

See footnotes at end of table.

**Table 1.—Portugal: Production of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Petroleum refinery products: | | | | |
| Gasoline | thousand 42-gallon barrels | 4,616 | 4,660 | 5,969 |
| Jet fuel | do | 2,048 | 2,017 | 1,583 |
| Kerosine | do | 1,240 | 1,097 | 481 |
| Distillate fuel oil | do | 7,080 | 6,825 | 7,821 |
| Residual fuel oil | do | 10,410 | 10,550 | 15,614 |
| Lubricants | do | 644 | 625 | 726 |
| Other: | | | | |
| Liquefied petroleum gas | do | 1,125 | 1,131 | 1,357 |
| Asphalt | do | 17 | 216 | 1,288 |
| Unspecified | do | 2,174 | 2,087 | 319 |
| Refinery fuel and losses | do | 2,474 | 2,662 | 1,369 |
| Total | do | 31,828 | 31,870 | 36,527 |

e Estimate. p Preliminary. r Revised.
1 Less than ½ unit.
2 Includes production from the Azores and Madiera Islands as follows in thousand tons: 1972: Azores—15; Madiera—30; 1973: Azores—20; Madiera—31; 1974: Azores—14; Madiera—31. The balance of output in each year was from continental Portugal.

## TRADE

The Portuguese trade deficit increased substantially in 1974, with the value of exports approximating $2.26 billion and the value of imports $4.46 billion. The deficit of $2.2 billion compares with $1.12 billion in 1973, and $950 million and $617 million in 1972 and 1971, respectively. The unsettled political climate adversely affected most business firms, large and small, so that the tonnage of exports declined in most categories, whereas import tonnages were equalled or increased when compared with those of 1973. The considerably higher prices paid for raw materials and high-technology material resulted in the marked increase in the foreign trade deficit. For example, the aggregate of 11 solid fuels, nonferrous metals, iron ore, and steel import commodities totaled 1,812,090 tons valued at $327 million in 1974, compared with 1,885,550 tons valued at $169 million in 1973. Steel, in ingot, slab, coils, and plate form, accounted for 74% of the 1974 import value of these commodities, followed by copper, phosphate rock, zinc, bituminous coal, and iron ore.

During 1974, trade patterns did not change significantly, but the relative value of mineral and metal exports declined when compared with that of textiles, clothing, and other manufactured apparatus and machines. Some of the largest categories of exports in 1973, the last year for which detailed values were available, included (1) textiles and clothing, $507 million; (2) processed food products and beverages, $258 million; (3) electrical components and machines, $191 million; (4) wood products, $169 million; (5) pearls, gems, and precious metals and products, $105 million; (6) chemical industry products, $95 million; and (7) paper and paper products, $93 million. Imports, by major classifications, in order of value included (1) electrical apparatus and machines, $552 million; (2) transportation equipment, $371 million; (3) textile materials and fabrics, $364 million; (4) base metals and products, $257 million, including $130 million of iron and steel products; (5) chemical industry products, $234 million, including $73 million in organic chemicals); (6) vegetable products, $233 million; and (7) mineral products, $204 million, including $182 million for coal, crude petroleum, and petroleum products.

Exports from Portugal went to (1) Europe, accounting for 66% of the total, of which the principal countries were the United Kingdom, West Germany, Sweden, France, and Italy; (2) the Overseas Provinces, 15%; and (3) the United States, 9.8%. Of the imports, European Countries dominated by West Germany, the United Kingdom, France, Spain, and Sweden, supplied 65%; the Overseas Provinces provided 10%; and the United States, 8.2%

Imports from the United States were valued at $240 million in 1973, whereas exports to the United States were valued at $173 million. Principal items imported from the United States included (1)

cereal grains, $74 million; (2) cotton and other fibers $38 million; (3) electrical apparatus and machines, $25 million; (4) aircraft and parts, $19 million; (5) soya bean products, $15 million; (6) iron and steel products, $9 million; and (7) raw cotton, $8 million. Principal exports to the United States were (1) clothing and accessories, $20 million; (2) electrical and electronic components, $19 million; (3) cork and cork products, $15 million; (4) tomato pastes, $12 million; and (5) prepared foods, $9 million.

**Table 2.—Portugal: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, all forms | 220 | 1,210 | Norway 679; Spain 316; Angola 62. |
| Arsenic trioxide, pentoxide, acids | 170 | 211 | Argentina 88; Australia 36; Spain 35. |
| Chromium oxide and hydroxide | 1 | 1 | Mainly to Angola. |
| Columbium and tantalum, tantalum ore and concentrate | 10 | 22 | All to United States. |
| Copper: | | | |
| Ore | -- | 20 | All to France. |
| Copper sulfate | 749 | 205 | St. Thomas and Principe 185; Angola 17. |
| Metal including alloys, all forms | r 1,000 | 2,500 | United Kingdom 585; United States 513; Italy 321. |
| Gold: | | | |
| Waste and sweepings - troy ounces | 233,705 | -- | |
| Metal do | 64 | 2,382 | All to Angola. |
| Iron and steel: | | | |
| Ore and concentrate, including roasted pyrite: | | | |
| Roasted pyrite | 3 | 4 | All to Finland. |
| Other | r 72 | 46 | West Germany 45. |
| Metal: | | | |
| Scrap | 19,256 | 50,109 | Spain 33,243; Thailand 11,300. |
| Pig iron, ferroalloys, similar materials | 9,332 | 11,454 | West Germany 8,487; United Kingdom 1,090. |
| Steel, primary forms | 2,890 | -- | |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 14,654 | 10,015 | Angola 6,348; Cape Verde Islands 735; Mozambique 651. |
| Universals, plates, sheets | 7,086 | 7,932 | Israel 1,560; Portuguese Guinea 1,350; West Germany 1,239. |
| Hoop and strip | 591 | 882 | Angola 735. |
| Rails and accessories | 38 | 100 | Mozambique 72; Angola 28. |
| Wire | 2,644 | 1,788 | Angola 609; United Kingdom 534; Mozambique 248. |
| Tubes, pipes, fittings | 4,948 | 5,073 | Angola 915; West Germany 743; Mozambique 705. |
| Castings and forgings, rough | r 1,224 | 1,819 | United Kingdom 977; Sweden 191; Angola 88. |
| Lead: | | | |
| Ore and concentrate | 1,735 | 1,335 | All to France. |
| Oxides | 57 | 54 | Angola 40; Mozambique 14. |
| Metal including alloys, all forms | r 515 | 175 | Angola 124; Mozambique 44. |
| Magnesium metal including alloys, all forms | 7 | 7 | All to United Kingdom. |
| Manganese: | | | |
| Ore and concentrate | 7,360 | 3,386 | Spain 3,093; Netherlands 293. |
| Oxides | 10 | (1) | All to Angola. |
| Mercury 76-pound flasks | 9 | 2 $1,337 | Mainly to Angola. |
| Molybdenum ore and concentrate | 5 | -- | |
| Nickel metal including alloys, all forms | 26 | 193 | United Kingdom 89. |
| Platinum-group metals and silver: | | | |
| Waste and sweepings thousand troy ounces | 1,590 | 2,362 | Belgium-Luxembourg 1,455; United Kingdom 907. |
| Metals including alloys: | | | |
| Platinum group troy ounces | 2,549 | 1,905 | United Kingdom 790; France 529; West Germany 521. |
| Silver do | 6,406 | 5,942 | Angola 2,822; United States 1,254; Venezuela 1,230. |
| Tin metal including alloys, all forms long tons | 109 | 187 | United Kingdom 67; United States 28; Mozambique 22. |

See footnotes at end of table.

## Table 2.—Portugal: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Tungsten: | | | |
| Ore and concentrate | r 736 | 1,807 | Netherlands 680; West Germany 428; United Kingdom 372. |
| Metal including alloys, all forms | 3 | 21 | France 19; Switzerland 2. |
| Zinc: | | | |
| Ore and concentrate | 2,762 | 2,150 | All to France. |
| Oxide | 167 | 223 | Angola 80; Spain 52; Brazil 50. |
| Metal including alloys, all forms | r 313 | 366 | Belgium-Luxembourg 238; Spain 67; France 49. |
| Other: | | | |
| Ore and concentrate: | | | |
| Of titanium, vanadium, zirconium | r 25 | 618 | All to Italy. |
| Of base metals, n.e.s | -- | 49 | Japan 25; Brazil 21. |
| Ash and residue containing nonferrous metals | 788 | 393 | Belgium-Luxembourg 285; United Kingdom 51; Italy 35. |
| Oxides, hydroxides, peroxides of metals, n.e.s | 6 | 1 | Mainly to Mozambique. |
| Base metals including alloys, all forms, n.e.s | (1) | 25 | Mainly to United Kingdom. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 19 | 29 | Mozambique 18; Angola 11. |
| Grinding and polishing wheels and stones | 185 | 166 | Angola 56; United States 42; Mozambique 21. |
| Asbestos | r 1 | 2 | All to Mozambique. |
| Barite and witherite | 12 | 21 | Angola 14; Portuguese Guinea 7. |
| Cement | 69,152 | 89,834 | Cape Verde 22,974; Spain 20,011; Portuguese Guinea 14,193. |
| Chalk | 146 | 144 | Angola 119; Mozambique 20. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Kaolin | 2,094 | 266 | Morocco 150; Angola 68; Spain 35. |
| Other | 458 | 1,465 | Spain 1,298; Angola 71; Mozambique 34. |
| Products: | | | |
| Refractory (including nonclay bricks) | r 882 | 747 | Angola 449; Portuguese Guinea 133; Mozambique 79. |
| Nonrefractory | 22,228 | 28,782 | Spain 7,062; Gibraltar 5,328; Cape Verde 4,814. |
| Diamond: | | | |
| Gem, not set or strung thousand carats | 1,465 | 1,495 | United Kingdom 1,457; Belgium-Luxembourg 38. |
| Industrial do | 858 | 662 | All to United Kingdom. |
| Diatomite and other infusorial earth | 86 | 77 | Angola 43; United Kingdom 12; Venezuela 8. |
| Feldspar, leucite, nepheline, etc | 6,718 | 9,140 | Italy 4,712; United Kingdom 2,874; France 1,554. |
| Fertilizer materials, natural and manufactured: | | | |
| Nitrogenous | 116,799 | 90,401 | West Germany 46,424; El Salvador 11,000; Angola 10,364. |
| Phosphatic | 65,474 | 51,239 | Brazil 20,000; United Kingdom 15,964; Angola 5,052. |
| Potassic | 2,026 | 1,706 | Angola 1,105; St. Thomas and Principe 542; Mozambique 30. |
| Other, including mixed | 40,937 | 34,516 | Angola 17,469; United Kingdom 14,796; Cyprus 1,076. |
| Ammonia | 92,648 | 56,378 | Greece 30,593; United Kingdom 18,180; Finland 5,016. |
| Graphite, natural | 5 | 9 | Angola 7; Mozambique 2. |
| Gypsum and plasters | 241 | 260 | Mozambique 203; Cape Verde Islands 24; Angola 19. |
| Lime | 1,022 | 941 | Mozambique 559; Portuguese Guinea 135; St. Thomas and Principe 129. |
| Magnesite | 1 | (1) | Cape Verde Islands and Mozambique. |
| Mica, all forms | 377 | (1) | Angola and Mozambique. |
| Pigments, mineral: | | | |
| Natural, crude | 79 | 70 | Angola 31; Mozambique 16; Portuguese Guinea 10. |
| Iron oxides, processed | 56 | 52 | Mozambique 20; Angola 14; Cape Verde Islands 8; Portuguese Guinea 8. |

See footnotes at end of table.

## Table 2.—Portugal: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Pyrite (gross weight) | 114,109 | 76,340 | All to Belgium-Luxembourg. |
| Salt | 459 | 359 | Finland 230; Angola 50; Portuguese Guinea 24. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 1,554 | 1,288 | Angola 991; Mozambique 179; St. Thomas and Principe 61. |
| Caustic potash, sodic and potassic peroxides | 25 | 11 | Portuguese Guinea 8; Cape Verde Islands 2. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Marble and other calcareous | 113,595 | 138,564 | Italy 47,469; Spain 27,074; West Germany 26,728. |
| Slate | 7,679 | 9,828 | Belgium-Luxembourg 3,747; Denmark 2,033; West Germany 1,740. |
| Granite and other | 9,458 | 10,496 | Italy 9,198; Japan 421; Canada 255. |
| Worked: | | | |
| Slate | 4,920 | 6,095 | Netherlands 2,235; Belgium-Luxembourg 1,340; West Germany 811. |
| Paving and flagstone | 101,365 | 147,560 | West Germany 78,179; United Kingdom 26,045; Denmark 17,819. |
| Marble and other | 45,535 | 20,664 | West Germany 9,021; France 3,823; United States 1,995. |
| Dolomite, chiefly refractory grade | 10 | 4 | All to France. |
| Gravel and crushed rock | 6,962 | 12,855 | Gibraltar 11,028; Mozambique 1,185; Italy 400. |
| Limestone (except dimension) | 411 | 242 | St. Thomas and Principe 125; Mozambique 78; Cape Verde Islands 17. |
| Quartz and quartzite | 130,914 | 134,809 | Norway 63,842; Italy 48,563; Sweden 19,572. |
| Sand, excluding metal bearing | 45,924 | 47,031 | Gibraltar 32,935; Italy 9,911; France 1,500. |
| Sulfur: | | | |
| Elemental, all forms | 44 | 585 | Angola 428; Mozambique 50; Morocco 50. |
| Sulfuric acid | 44,962 | 41,790 | Morocco 22,550 Spain 9,580; Turkey 6,840. |
| Talc, steatite, soapstone, pyrophyllite | 124 | 176 | Angola 168; Mozambique 6. |
| Other nonmetals, n.e.s.: | | | |
| Slag, dross and similar waste, not metal-bearing, from iron and steel manufacture | (1) | 6 | All to Netherlands. |
| Oxides and hydroxides of magnesium, strontium and barium | 21 | 5 | Angola 4. |
| Bromine, iodine, fluorine | 1 | 1 | Mainly to Angola. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 2,832 | 4,274 | Cape Verde Islands 2,451; West Germany 1,124. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 144 | 1,896 | Portuguese Guinea 1,183; Cape Verde Islands 685. |
| Carbon black | 7 | 7 | Angola 4; Mozambique 2. |
| Coal, all grades, including briquet | 86 | 162 | Switzerland 100; Cape Verde Islands 41; Portuguese Guinea 20. |
| Coke and semicoke | 3,828 | 15,654 | Netherlands 13,679; Yugoslavia 1,935; Angola 30. |
| Hydrogen and rare gases | 2 | (1) | Mainly to Portuguese Guinea. |
| Petroleum refinery products: | | | |
| Bunker deliveries: | | | |
| Gasoline, aviation thousand 42-gallon barrels | r 19 | 9 | Foreign flag vessels and aircraft. |
| Kerosine do | -- | (1) | |
| Jet fuel do | 687 | 721 | |
| Distillate fuel oil do | 133 | 166 | |
| Residual fuel oil do | 581 | 472 | |
| Lubricants do | 13 | 18 | |
| Total do | 1,433 | 1,386 | |
| Gasoline: | | | |
| Aviation do | 29 | 44 | All to Portuguese Guinea. |
| Motor do | 56 | 85 | Portuguese Guinea 72; Cape Verde Islands 9; St. Thomas and Principe 3. |
| Kerosine do | 511 | 743 | United Kingdom 326; Denmark 216; Netherlands 159. |

See footnotes at end of table.

## Table 2.—Portugal: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum refinery products—Continued | | | |
| Jet fuel thousand 42-gallon barrels | 220 | 4 | Cape Verde Islands 3; Portuguese Guinea 1. |
| Distillate fuel oil ---- do | 545 | 358 | Netherlands 182; Portuguese Guinea 119; Denmark 33. |
| Residual fuel oil ---- do | 539 | -- | |
| Lubricants ---- do | 357 | 321 | Spain 31; United Kingdom 69; Netherlands 59. |
| Other: | | | |
| Liquefied petroleum gas ---- do | 19 | 19 | Portuguese Guinea 10; Cape Verde Islands 8. |
| Mineral jelly and wax ---- do | 22 | 20 | Spain 11; United Kingdom 4; West Germany 2. |
| Unspecified ---- do | 4 | 2 | Mainly to Angola. |
| Grand total ---- do | r 3,735 | 2,982 | |

r Revised.
1 Less than ½ unit.
2 1973 value; 1972 value $2,878.

## Table 3.—Portugal: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 318 | 617 | All from Surinam. |
| Metal including alloys, all forms: | | | |
| Scrap | r 158 | 115 | France 62; United States 7; Spain 5. |
| Unwrought | r 2,442 | 4,295 | Norway 2,766; United Kingdom 449; France 344. |
| Semimanufactures | r 21,634 | 18,127 | Belgium-Luxembourg 2,521; Spain 2,446; Canada 2,257. |
| Beryllium: | | | |
| Beryl ore and concentrate | 1,271 | 311 | Australia 86; Netherlands 72; United Kingdom 60. |
| Metal including alloys, all forms | 1 | -- | |
| Chromium: | | | |
| Chromite | 379 | 327 | Republic of South Africa 229. |
| Oxide and hydroxide | 170 | 280 | West Germany 201; Belgium-Luxembourg 20; United Kingdom 15. |
| Cobalt oxide and hydroxide | 82 | 57 | Mozambique 45. |
| Copper: | | | |
| Ore | 56 | -- | |
| Matte | 2 | -- | |
| Copper sulfate solution | 917 | 885 | United Kingdom 714; France 168. |
| Metal including alloys: | | | |
| Scrap | 352 | 394 | Mozambique 72; Portuguese Guinea 55; Cape Verde Islands 40. |
| Unwrought: | | | |
| Blister | 999 | 1,599 | Mainly from Zambia. |
| Refined, unalloyed | 6,509 | 6,334 | Belgium-Luxembourg 3,124; Canada 2,763; United Kingdom 278. |
| Other | 1,310 | 2,114 | United Kingdom 1,491; Denmark 545; West Germany 60. |
| Semimanufactures | r 7,731 | 8,931 | United Kingdom 2,710; France 1,920; Italy 1,497. |
| Gold metal, unworked or partly worked troy ounces | 115 | 1,129 | Belgium-Luxembourg 809; West Germany 177; United States 96. |
| Iron and steel: | | | |
| Ore and concentrate | r 1 365,603 | 491,717 | Angola 172,175; Brazil 159,698; Republic of South Africa 79,077. |
| Metal: | | | |
| Scrap | r 24,095 | 6,288 | United Kingdom 544; West Germany 214; Portuguese Guinea 98. |
| Pig iron, ferroalloys, similar materials | 22,898 | 39,832 | Spain 32,922; Canada 2,963; West Germany 1,258. |
| Steel, primary forms | 206,805 | 191,339 | Japan 89,685; United States 40,410; Netherlands 29,366. |

See footnotes at end of table.

## Table 3.—Portugal: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Metal—Continued | | | |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 66,226 | 99,832 | West Germany 20,112; Belgium-Luxembourg 17,338; Netherlands 13,707. |
| Universals, plates, sheets | 141,511 | 187,267 | West Germany 66,322; Japan 34,352; Sweden 21,650. |
| Hoop and strip | 21,942 | 29,076 | Belgium-Luxembourg 22,215; West Germany 1,981; United Kingdom 1,950. |
| Rails and accessories | 5,166 | 15,620 | Belgium-Luxembourg 10,215; France 2,980; West Germany 1,383. |
| Wire | 12,629 | 11,150 | United Kingdom 2,483; West Germany 2,393; Belgium-Luxembourg 1,898. |
| Tubes, pipes, fittings | 16,204 | 23,664 | West Germany 8,662; France 5,217; Spain 1,685. |
| Castings and forgings, rough | 619 | 767 | West Germany 238; United Kingdom 92; France 70. |
| Lead: | | | |
| Oxides | 72 | 77 | Mainly from United Kingdom. |
| Metal including alloys: | | | |
| Scrap | 261 | 309 | Malta 221; Portuguese Guinea 32; United Kingdom 29. |
| Unwrought | 10,493 | 10,074 | Mexico 4,356; United Kingdom 4,217; Australia 852. |
| Semimanufactures | 187 | 234 | United Kingdom 147; West Germany 31; Austria 24. |
| Magnesium metal including alloys, all forms | r 7 | 9 | United Kingdom 5; West Germany 2; Norway 1. |
| Manganese: | | | |
| Ore and concentrate | 362 | 123 | Republic of South Africa 120; Netherlands 3. |
| Oxides | 357 | 444 | United Kingdom 191; Japan 80; Belgium-Luxembourg 73. |
| Mercury 76-pound flasks | r 696 | 319 | Mainly from Spain. |
| Molybdenum: | | | |
| Ore and concentrate kilograms | 4,400 | -- | |
| Metal including alloys, all forms do | 1,200 | 1,600 | Mainly from United Kingdom. |
| Nickel metal including alloys: | | | |
| Scrap | 1 | 100 | Mainly from Canada. |
| Unwrought | 53 | 65 | United Kingdom 22; Netherlands 12; Finland 11. |
| Semimanufactures | 446 | 465 | United Kingdom 187; West Germany 151; Finland 41. |
| Platinum-group metals and silver: | | | |
| Waste and sweepings troy ounces | 5 | -- | |
| Metals including alloys: | | | |
| Platinum group do | 2,747 | 3,526 | France 1,216; West Germany 970; United Kingdom 892. |
| Silver thousand troy ounces | r 1,507 | 1,812 | United Kingdom 1,028; West Germany 566; Switzerland 143. |
| Rare-earth metals: | | | |
| Oxides | 6 | 10 | France 7; United Kingdom 2. |
| Metals including alloys kilograms | 400 | 200 | All from West Germany. |
| Tin: | | | |
| Oxides long tons | 12 | 13 | West Germany 7; Austria 3. |
| Metal including alloys: | | | |
| Scrap do | 1 | -- | |
| Unwrought do | 392 | 312 | United Kingdom 169; Belgium-Luxembourg 138. |
| Semimanufactures do | 25 | 46 | Netherlands 17; France 12; United Kingdom 6. |
| Titanium: | | | |
| Ore and concentrate, rutile | 149 | 268 | Australia 217; Austria 51. |
| Oxides | 4,712 | 6,014 | United Kingdom 2,085; West Germany 1,366; Finland 1,117. |
| Tungsten metal including alloys, all forms | (2) | 6 | Mainly from Switzerland. |
| Zinc: | | | |
| Ore and concentrate | -- | 4 | All from United Kingdom. |
| Oxide | 262 | 296 | West Germany 88; Norway 63; United Kingdom 58. |

See footnotes at end of table.

## Table 3.—Portugal: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Zinc—Continued | | | |
| Metal including alloys: | | | |
| Scrap | 153 | 131 | Netherlands 60; United Kingdom 50; Belgium-Luxembourg 20. |
| Blue powder | 46 | 148 | United Kingdom 97; Norway 49. |
| Unwrought | r 10,829 | 11,488 | Belgium-Luxembourg 5,711; United Kingdom 1,614; North Korea 1,100. |
| Semimanufactures | 1,129 | 1,094 | West Germany 476; Belgium-Luxembourg 266; United Kingdom 206. |
| Other: | | | |
| Ore and concentrate: | | | |
| Of titanium, vanadium, zirconium | 578 | 474 | Australia 429; United Kingdom 45. |
| Of base metals, n.e.s | (2) | 742 | Guyana 698; United Kingdom 38; France 6. |
| Oxides, hydroxides, peroxides of metals, n.e.s | 1,625 | 1,961 | United Kingdom 1,299; Spain 244; West Germany 241. |
| Metals including alloys all forms: | | | |
| Metalloids | 186 | 67 | Sweden 56; West Germany 5; Netherlands 4. |
| Alkali, alkaline earth, rare-earth metals - kilograms | 400 | 200 | All from West Germany. |
| Pyrophoric alloys | 3 | 4 | Austria 2; United Kingdom 1. |
| Base metals including alloys, all forms, n.e.s | 109 | 95 | People's Republic of China 39; Belgium-Luxembourg 21; United Kingdom 15. |
| NONMETALS | | | |
| Abrasives: | | | |
| Natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 594 | 475 | Italy 183; Netherlands 117; Greece 60. |
| Dust and powder of precious and semiprecious stones (including diamond) kilograms | 63 | 113 | Switzerland 65; United Kingdom 31; United States 13. |
| Grinding and polishing wheels and stones | 443 | 518 | United Kingdom 160; Spain 81; West Germany 79. |
| Artificial corundum | 745 | 651 | France 226; West Germany 224; Austria 88. |
| Asbestos | 5,515 | 8,701 | Canada 3,433; Republic of South Africa 1,812; Mozambique 836. |
| Barite and witherite | 290 | 840 | West Germany 650; United Kingdom 114; France 66. |
| Boron materials: | | | |
| Crude natural borates | 980 | 817 | United States 525; Netherlands 272. |
| Oxide and acid | 145 | 187 | France 118; Turkey 40; Spain 19. |
| Cement | 5,115 | 46,827 | Sweden 45,494; France 968; Spain 236. |
| Chalk | 4,973 | 6,658 | France 3,621; Spain 1,155; Belgium-Luxembourg 1,106. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 5,214 | 7,194 | Spain 3,031; Morocco 928; United States 908. |
| Kaolin | 5,335 | 5,827 | United Kingdom 4,275; France 810; United States 397. |
| Other | r 3,430 | 3,560 | Spain 1,630; United Kingdom 1,011; France 276. |
| Products: | | | |
| Refractory (including nonclay bricks) | 14,630 | 7,269 | West Germany 2,034; Austria 1,255; Italy 948. |
| Nonrefractory | 2,653 | 3,678 | Spain 2,539; Italy 938. |
| Cryolite and chiolite | 75 | 73 | Denmark 70. |
| Diamond, except powder and dust: | | | |
| Gem, not set or strung thousand carats | 15 | 7 | Angola 3; Belgium-Luxembourg 2; United Kingdom 1. |
| Industrial do | 18 | 11 | Mainly from Israel. |
| Unclassified do | 2,190 | 1,942 | All from Angola. |
| Diatomite and other infusorial earth | 2,425 | 3,272 | Spain 1,507; United States 658; France 554. |
| Feldspar, leucite, nepheline, etc | 2,194 | 1,521 | Spain 968; United Kingdom 476. |

See footnotes at end of table.

**Table 3.—Portugal: Imports of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | r 1,600 | 1,420 | Chile 1,400; West Germany 20. |
| Phosphatic | 297,829 | 298,354 | Morocco 257,900; Senegal 39,680. |
| Manufactured: | | | |
| Nitrogenous | r 14,319 | 13,515 | Netherlands 8,422; France 2,601; Belgium-Luxembourg 1,950. |
| Phosphatic | 9,183 | 8,276 | Belgium-Luxembourg 6,725; France 1,551. |
| Potassic | 47,212 | 41,916 | Spain 36,838; West Germany 5,077. |
| Other, including mixed | 41,840 | 45,856 | Belgium-Luxembourg 13,249; United Kingdom 12,807; West Germany 11,999. |
| Graphite, natural | 436 | 322 | United Kingdom 256; West Germany 29. |
| Gypsum and plasters | 30,629 | 33,549 | Morocco 32,535; Spain 843; West Germany 69. |
| Iodine | 3 | 6 | All from Japan. |
| Lime, hydraulic | 1 | (2) | All from France. |
| Magnesite | 478 | 472 | Netherlands 270; Austria 82; Belgium-Luxembourg 37. |
| Mica: | | | |
| Crude, including splittings and waste | 274 | 391 | Norway 183; United Kingdom 182; Republic of South Africa 10. |
| Worked, including agglomerated splittings | -- | 10 | Switzerland 4; Spain 2; United Kingdom 2. |
| Pigments, mineral: | | | |
| Natural, crude | 70 | 61 | Austria 41; France 8; Spain 7. |
| Iron oxides, processed | 1,679 | 1,789 | West Germany 845; Spain 507; Belgium-Luxembourg 258. |
| Salt and brine | 88,095 | 53,469 | Cape Verde Islands 15,195; Italy 13,520; Tunisia 12,998. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 46 | 31 | Sweden 13; Spain 6; France 5. |
| Caustic potash, sodic and potassic peroxides | 253 | 455 | Italy 224; West Germany 81; France 65. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 1,685 | 2,238 | Angola 1,671; Iran 497; Italy 53. |
| Worked | -- | 188 | Spain 103; Italy 66; Belgium-Luxembourg 10. |
| Dolomite, chiefly refractory grade | 5,884 | 5,512 | Italy 3,995; Norway 1,115; Spain 300. |
| Gravel and crushed rock | 135 | 334 | Denmark 193; France 60; Belgium-Luxembourg 39. |
| Quartz and quartzite | 161 | 149 | Sweden 77; Belgium-Luxembourg 59; Switzerland 10. |
| Sand, excluding metal bearing | 5,783 | 7,201 | Belgium-Luxembourg 5,828; Spain 834; Netherlands 330. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 30,515 | 23,262 | France 22,674; Belgium-Luxembourg 249; West Germany 210. |
| Colloidal | 50 | 265 | Belgium-Luxembourg 149; United Kingdom 60; West Germany 55. |
| Sulfur dioxide | 208 | 253 | West Germany 157; Netherlands 63; France 32. |
| Sulfuric acid | 5,306 | 21,073 | Poland 16,903; United Kingdom 4,112. |
| Talc, steatite, soapstone, pyrophyllite | 3,263 | 3,981 | France 1,802; Norway 791; Finland 380. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Meerschaum, amber, jet | -- | 1 | All from France. |
| Other | r 6,479 | 9,922 | Cape Verde Islands 8,596; Spain 430; West Germany 430. |
| Slag, dross and similar waste, not metal bearing: | | | |
| From iron and steel manufacture | -- | 4,259 | All from Norway. |
| Slag and ash, n.e.s | 3 | 1 | All from West Germany. |
| Oxides and hydroxides of magnesium, strontium, and barium | 97 | 1,300 | United Kingdom 1,185; United States 30; West Germany 29. |
| Bromine and other halogens (excluding iodine) | 7 | 11 | Japan 10. |

See footnotes at end of table.

Table 3.—Portugal: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Other nonmetals, n.e.s.—Continued | | | |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 625 | 403 | West Germany 141; United Kingdom 81; Belgium-Luxembourg 80. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 1,414 | 1,147 | Netherlands 900; United States 110; France 100. |
| Carbon black and gas carbon: | | | |
| Carbon black | 8,481 | 9,017 | Spain 3,016; France 2,424; West Germany 1,391. |
| Gas carbon | 31 | 32 | All from West Germany. |
| Coal, all grades including briquet thousand tons | r 368 | 432 | United States 319; Poland 56; United Kingdom 54. |
| Coke and semicoke ---------- do | 177 | 38 | West Germany 14; Italy 8; Netherlands 7. |
| Hydrogen and rare gases | 12 | 20 | West Germany 12; Spain 4; Netherlands 2. |
| Peat, including peat briquet and litter | 735 | 842 | Spain 377; West Germany 223; Finland 92. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | r 31,348 | 31,677 | Saudi Arabia 14,409; Iraq 9,654; Angola 4,036. |
| Refinery products: | | | |
| Gasoline: | | | |
| Aviation -------- do | 135 | 97 | Italy 66; Netherlands 19; United Kingdom 10. |
| Motor ---------- do | 1,040 | 953 | Spain 565; Italy 247; France 90. |
| Total -------- do | r 1,175 | 1,050 | |
| Kerosine and jet fuel do | r 445 | 472 | Italy 260; Netherlands 146; Belgium-Luxembourg 24. |
| Distillate fuel oil --- do | 1,346 | 1,552 | Netherlands 463; Italy 334 United Kingdom 281. |
| Residual fuel oil ------ do | 1,443 | 1,679 | Mozambique 807; Netherlands 375; Italy 173. |
| Lubricants ---------- do | r 201 | 145 | United Kingdom 41; France 33; Belgium-Luxembourg 24. |
| Other: | | | |
| Liquefied petroleum gas do | 2,774 | 3,114 | France 1,142; Netherlands 661; Spain 516. |
| Mineral jelly and wax do | 26 | 38 | West Germany 31; Japan 3. |
| White spirit ---- do | 19 | 26 | France 14; Belgium-Luxembourg 6; Netherlands 3. |
| Unspecified ------ do | 274 | 351 | Curaçao Islands 96; Spain 95; France 45. |
| Grand total --- do | r 7,703 | 8,427 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 12,526 | 14,862 | United Kingdom 5,270; Netherlands 4,708; Spain 4,011. |

r Revised.
1 Includes pyrite.
2 Less than ½ unit.

## COMMODITY REVIEW

### METALS

Production of lead concentrates continued at about the reduced level of 1973. Zinc mine output resumed at the higher levels achieved in 1972. Otherwise, there was little change in the variety of minerals produced. In general, the unsettled political climate impeded production and halted announcements of new projects or developments at existing facilities.

*Iron and Steel.*—At yearend, continuously cast steel billets were produced for the first time in Portugal, at the rate of 22,000 tons per month. Output was presumably at the Siderúrgia Nacional plant at Seixal where Phase 1 of an expansion program was to be completed in 1974. The Government announced Phase 2 of the expansion program was to be completed in 1978 or 1979. Primary items are a new blast furnace of 1.5-million-tons-per-

year capacity, a basic oxygen furnace (BOF) plant of 1.6-million-tons-per-year capacity, and associated continuous-casting equipment. No details of progress on the Phase 1 program have been received, and the production potential of existing facilities was not realized in 1974, apparently because of labor strife that lasted several months. As a result, steel was imported at a much higher rate than previouly (803,000 tons in 1974 versus 573,000 tons in 1973) and was the dominant item in the value of mineral and metal imports. Mining of hematite ore (40% iron) was resumed at yearend at an annual rate of approximately 75,000 tons.

## NONMETALS

Production of most nonmetallic minerals continued at the same or lower rates in 1974, when compared with those of 1973. Production of quartzite showed a modest increase and cupriferous pyrite a modest decrease in 1974. As a part of the nationization program for major industry segments, the Government assumed a controlling interest in the fertilizer industry and effected a merger of Amoniaco Portugues, Sociedade Portuguesa de Petroquimica, and Nitratos de Portugal. Investments approximating $195 million were also announced to increase domestic fertilizer production by 1980, including a new fertilizer plant in the Sines industrial zone.

## MINERAL FUELS

Construction continued on the new oil refinery and port facilities at Sines which were expected to be in operation in 1976. Several associated petrochemical projects have been projected for operation in the first phase which is to be completed in 1977 or 1978. A 230,000-ton-per-year ethylene plant has been announced, with downstream facilities including a low-density polyethylene plant of 120,000-ton-per-year capacity, a polypropylene plant of 50,000-ton-per-year capacity, a high-density polyethylene plant of 30,000-ton-per-year capacity, a vinyl chloride monomer plant of 150,000-ton-per-year capacity, and a polyvinyl chloride plant of 55,000-ton-per-year capacity.

Although several exploratory oil wells were drilled offshore during the year, no reports of indications were made public.

To substantially increase anthracite coal production, additional coal miners were employed late in 1974.

# The Mineral Industry of Romania

By Joseph B. Huvos [1]

Romania's centrally planned economy was based on mutually coordinated production schedules and production targets were predetermined by the 1971–75 national plan for economic development. Romania's economic growth is closely linked to its mineral resources and while these mineral resources have little significance by world standards, they are quite important to the country's economy.

Compared with 1973, raw coal production increased by 2,543,000 tons, crude steel by 679,000 tons, mineral fertilizers (100% active substance) by 169,000 tons, and cement by 1,347,000 tons. Natural gas production increased by 877 million cubic meters, and electric power by 2.3 billion kilowatt-hours. There were also increases in the output of nonferrous metals, petroleum products, and petrochemicals.

Gains in mineral industry production were achieved mainly by massive construction of new plants and installation of new equipment, thereby accelerating industrialization but leaving less time for improving efficiency and quality. Often western technology and processes were used to achieve industrial goals.

There were about 52,700 persons employed in the coal industry, 32,500 in the petroleum industry, 71,100 in the ferrous mining industry, about 66,100 in the nonferrous mining and metallurgical industries, 11,100 in the nonmetallic minerals industry, and 32,400 persons in the electric power industry. Average monthly income in industry was about 1,660 lei,[2] an increase of 7.2% over that of 1973. To ease the shortage of labor, pensioners were encouraged to return to active employment.

Extensive prospecting and exploration for mineral resources continued. In 1974, Romania's industry invested 61.3 billion lei in new plants and equipment, an increase of 9.5% over that of 1973. Of this, 8.3 billion lei was for electric power and heating, 7.5 billion lei for the fuels industry, 6.2 billion lei for the iron and steel industry, and 9.7 billion lei for the chemical industry.

Major productive capacity went onstream at the Slatina aluminum reduction plant, the thermoelectric plants on the Somes and the Olt Rivers, the Galati Siderurgical Combine, the alloy plant at Tirgoviste, and the wire mill at Buzau.

Romania's supply-demand balance for the more important mineral products did not change much in 1974. The only exports of mineral products significant by world trade standards in 1973 were 6.5 million tons of petroleum products, 1.4 million tons of steel semimanufactures, 58,589 tons of nonferrous metals including aluminum, 291,965 tons of fertilizer materials, and 1.8 million tons of cement.

One of the more important government measures concerning the mineral industries was the reorganization of the Ministry of Mines, Petroleum and Geology. Decree No. 42/1974 of February 18, 1974, divided the Ministry in two general directorates (petroleum and gas, and geology), and eight specific directorates (planning, technical, organization, investments, international cooperation, finance, supply and marketing, and administration). Five regional centers were established (the Petrosani coal center, Baia Mare nonferrous mining and metallurgy center, Deva ore mining center, Medias natural gas center, and Bucharest salt and nonmetallic minerals center).

[1] Foreign mineral specialist, Division of Coal.

[2] Values have not been converted from Romanian currency units (lei) to U.S. dollars, because of the wide variation between the official exchange rate (lei 6=US$1.00); tourist rate (lei 18=US$1.00), and various other exchange rates used for individual transactions.

## PRODUCTION

Mineral production statistics were not reported for a number of commodities, and much of the data in the production table is estimated. New capacity was added in many branches of the Romanian mineral industry, which resulted in significantly increased production.

The Transylvanian part of the country, inside the semicircle of the Carpathian Mountains, produced almost all the natural gas, bituminous coal, nonferrous metals, and nonmetallic minerals. Almost all crude oil and lignite were produced in the plains outside of the Carpathian chain.

The most significant increases in production of mineral commodities were in the areas of aluminum, iron and steel, coal, fertilizer materials, and cement.

**Table 1.—Production of selected mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite, gross weight [e] | 305,000 | 345,000 | 345,000 |
| Alumina, gross weight [e] | 210,000 | 282,000 | 374,000 |
| Ingot (including alloys) | 121,533 | 141,241 | 187,000 |
| Bismuth, mine output, metal content [e] | 80 | 80 | 80 |
| Cadmium, smelter output [e] | 80 | 80 | 80 |
| Copper: [e] | | | |
| Mine output, metal content, recoverable | 35,000 | 42,000 | 50,000 |
| Smelter | 35,000 | 42,000 | 50,000 |
| Refined | 35,000 | 42,000 | 50,000 |
| Gold, mine output, metal content [e] troy ounces | 60,000 | 60,000 | 60,000 |
| Iron and steel: | | | |
| Iron ore thousand tons | 3,361 | 3,234 | 3,265 |
| Pig iron and blast furnace ferroalloys do | 4,890 | 5,713 | 6,081 |
| Crude steel do | 7,401 | 8,161 | 8,840 |
| Semimanufactures: | | | |
| Castings and forgings, finished do | 618 | 669 | NA |
| Pipes and tubes do | 880 | 902 | 973 |
| Rolled products do | 5,230 | 5,833 | 6,253 |
| Lead: [e] | | | |
| Mine output, metal content, recoverable | 38,000 | 41,000 | 41,000 |
| Smelter | 36,000 | 39,000 | 39,000 |
| Manganese ore: | | | |
| Gross weight [e] | 130,000 | 140,000 | 140,000 |
| Manganese content [e] | 30,000 | 34,000 | 34,000 |
| Silver, mine output, metal content [e] thousand troy ounces | 1,000 | 1,100 | 1,100 |
| Zinc: [e] | | | |
| Mine output, metal content, recoverable | 40,000 | 42,000 | 43,000 |
| Smelter | 40,000 | 42,000 | 43,000 |
| **NONMETALS** | | | |
| Barite [e] | 116,000 | 116,000 | 116,000 |
| Cement, hydraulic thousand tons | 9,212 | 9,848 | 11,195 |
| Chalk [e] do | NA | NA | 225 |
| Clays: [e] | | | |
| Bentonite | [r] 50,000 | [r] 50,000 | 62,800 |
| Kaolin | 50,000 | 50,000 | 87,400 |
| Refractory | NA | NA | 492,500 |
| Diatomite [e] | NA | NA | 40,000 |
| Feldspar | [e] 50,000 | [e] 50,000 | 58,200 |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous, N content thousand tons | 874 | 854 | 980 |
| Phosphatic, $P_2O_5$ content do | 313 | 361 | 404 |
| Fluorspar [e] | 15,000 | 15,000 | 15,000 |
| Graphite [e] | 6,000 | 6,000 | 6,000 |
| Lime thousand tons | 2,435 | 2,593 | 3,067 |
| Pyrite: [e] | | | |
| Gross weight do | 840 | 870 | 870 |
| Sulfur content do | 360 | 375 | 375 |
| Salt | 3,147 | 3,296 | 3,923 |
| Sand [e] | NA | NA | 1,130 |
| Sodium carbonate, manufactured, 100% $Na_2CO_3$ basis | 665,000 | 677,000 | 807,000 |
| Sulfuric acid (monohydrate) thousand tons | 1,162 | 1,311 | 1,358 |
| Talc [e] | 57,000 | 60,000 | 60,000 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Carbon black | 73,763 | 77,367 | 78,384 |

See footnotes at end of table.

**Table 1.—Production of selected mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Coal: | | | | |
| Run-of-mine: | | | | |
| Anthracite and bituminous | thousand tons | 8,073 | 8,294 | 8,523 |
| Brown | do | 641 | 654 | 683 |
| Lignite | do | 16,557 | 17,716 | 20,001 |
| Total | do | 25,271 | 26,664 | 29,207 |
| Washed (produced from above): | | | | |
| For coke and semicoke production | do | 1,205 | 1,344 | 1,525 |
| Lignite | do | 15,938 | 17,057 | 19,141 |
| Other (unspecified) | do | 6,016 | 6,450 | 6,292 |
| Total | do | 23,159 | 24,851 | 26,958 |
| Brown coal briquets | do | 97 | 169 | [e] 180 |
| Coke, metallurgical | do | 1,134 | 1,321 | 1,332 |
| Gas: | | | | |
| Manufactured (coke oven and blast furnace) | million cubic feet | [e] 19,390 | [e] 19,420 | 17,107 |
| Natural: | | | | |
| Gross production: | | | | |
| Associated | do | 191,616 | 197,725 | 208,284 |
| Nonassociated | do | 787,054 | 834,799 | 855,209 |
| Total | do | 978,670 | 1,032,524 | 1,063,493 |
| Marketed production | do | 925,522 | 975,548 | 1,004,803 |
| Petroleum: | | | | |
| Crude: | | | | |
| As reported | thousand tons | 14,128 | 14,287 | 14,486 |
| Converted [e] | thousand 42-gallon barrels | 105,296 | 106,481 | 107,964 |
| Refinery products: [2] | | | | |
| Gasoline | do | 26,648 | 28,568 | 29,325 |
| Jet fuel and kerosine | do | 8,471 | 7,936 | 7,597 |
| Distillate fuel oil | do | 38,165 | 41,754 | 39,273 |
| Residual fuel oil | do | 31,695 | 36,170 | 41,833 |
| Lubricants | do | 4,494 | 4,536 | 3,957 |
| Other: | | | | |
| Liquefied petroleum gas | do | 2,645 | 2,865 | 2,831 |
| Asphalt | do | 3,515 | 3,660 | 3,539 |
| Total | do | 115,633 | 125,489 | 128,355 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to the commodities listed, antimony, asbestos, gypsum, mica, and natural gas liquids, as well as a variety of crude construction materials are produced, but output is unreported and available general information is inadequate to permit formulation of reliable estimates of output levels.
[2] Romanian sources do not indicate whether refinery fuels are reported as a part of the listed product yields or not. Moreover, additional minor products may be produced but are not listed in official sources.

## TRADE

In Romania's mineral economy, international trade ranks high among the industry's priorities. The volume of trade is outlined in the national 5-year plan, and the trade itself is conducted by national trading enterprises and directed by the Ministry of Foreign Trade, according to national goals and priorities. Romanian foreign trade is oriented towards the importation of foreign technology for speeding up industrialization and providing missing raw materials. Romania's exports consist mainly of petroleum products and other processed raw materials.

The value of total Romanian trade turnover (exports plus imports) expanded by 38.3% from 36.0 billion lei in 1973 to 49.8 billion lei in 1974. Romanian trade with developed market economy countries in 1974 amounted to 23.3 billion lei; trade with developed market economy countries totaled 5.8 billion lei.

The value of total commodity trade with various groups of countries in 1970–74 follows in billion lei:

| Groups of countries | 1971 | 1972 | 1973 | 1974 | Percent increase 1973–74 |
|---|---|---|---|---|---|
| COMECON (CMEA) countries [1] | 11.8 | 13.3 | 15.3 | 17.3 | 13.1 |
| Other centrally planned economy countries | 1.0 | 1.1 | 2.5 | 3.4 | 36.0 |
| Total centrally planned economy countries | 12.8 | 14.4 | 17.8 | 20.7 | 16.3 |
| Developed market economy countries | 8.3 | 10.0 | 14.1 | 23.3 | 65.2 |
| Developing market economy countries | 4.1 | 4.4 | 4.1 | 5.8 | 41.5 |
| Total market economy countries | 12.4 | 14.4 | 18.2 | 29.1 | 59.9 |
| Grand total Romanian trade value | 25.2 | 28.8 | 36.0 | 49.8 | 38.3 |

[1] COMECON (CMEA)—Council for Mutual Economic Assistance comprising the following countries: Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the U.S.S.R.

## Table 2.—Romania: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys: | | | |
| Scrap | 3,683 | 3,689 | West Germany 2,383; France 956. |
| Unwrought and semimanufactures [3] | 51,500 | 49,000 | Japan 10,800; United Kingdom 9,800; People's Republic of China 8,000. |
| Copper metal including alloys, all forms [3] | 5,100 | 2,500 | All to West Germany. |
| Iron and steel: | | | |
| Scrap | 1,677 | 4,072 | All to Italy. |
| Pig iron and ferroalloys | 621 | 24,120 | Japan 23,240. |
| Steel, primary forms | [4]34,000 | 8,674 | Italy 5,411; Netherlands 3,004. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections [4] | 248,000 | 287,000 | NA. |
| Plates and sheets [3 5] | 575,500 | 759,700 | U.S.S.R. 322,800; West Germany 111,300. |
| Hoop and strip | r 7,627 | [4]43,000 | NA. |
| Wire [4] | 21,000 | 57,000 | NA. |
| Pipes, tubes, fittings [3 6] | 255,000 | 253,200 | U.S.S.R. 149,700; People's Republic of China 44,200. |
| Castings and forgings | r 15,236 | 11,523 | All to West Germany. |
| Total | r 1,122,363 | 1,411,423 | |
| Lead metal including alloys, all forms [3] | 1,300 | 200 | Italy 100, Netherlands 100. |
| Manganese ore [3] | r 83,593 | 20,800 | All to Japan. |
| Nickel scrap | -- | 46 | All to Sweden. |
| Silver: | | | |
| Waste and sweepings value, thousands | $1,383 | $116 | Italy $60; United Kingdom $56. |
| Metal crude and worked _ do | $1,198 | NA | |
| Zinc metal including alloys, all forms | 1,800 | 3,200 | West Germany 1,000; United Kingdom 900; Switzerland 400. |
| Other: | | | |
| Nonferrous scrap, n.e.s | r 140 | 24 | NA. |
| Base metals, n.e.s | 5 | NA | |
| NONMETALS | | | |
| Barite [3] | 25,000 | 27,800 | U.S.S.R. 16,600; Belgium-Luxembourg 11,200. |
| Cement, hydraulic [3] | r 1,081,300 | 1,781,100 | Poland 487,800; Hungary 447,800; Austria 210,900. |
| Clays and clay products: | | | |
| Crude, bleaching [7] | r 2,100 | 1,685 | All to Poland. |
| Products: | | | |
| Refractory | -- | 88,880 | Yugoslavia 88,163. |
| Nonrefractory | 102,345 | 89,261 | Yugoslavia 88,151. |
| Diamond, industrial value, thousands | -- | $140 | All to Belgium-Luxembourg. |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous | 311,591 | 271,312 | West Germany 123,753; France 109,836. |
| Phosphatic | 26,620 | 3,613 | Spain 2,570; West Germany 1,043. |
| Mixed | r 55,787 | 17,040 | Spain 10,646; France 4,736; West Germany 1,658. |

See footnotes at end of table.

## Table 2.—Romania: Exports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Lime | 2,764 | NA | |
| Mica | 256 | NA | |
| Pigments, mineral, natural | — | 337 | All to Italy. |
| Pyrite, unroasted | NA | 7,699 | All to West Germany. |
| Salt | 651,100 | 637,000 | Hungary 244,500; Bulgaria 164,000; Czechoslovakia 74,000. |
| Sodium and potassium compounds, n.e.s.: [3] | | | |
| Caustic soda | 115,200 | 78,900 | U.S.S.R. 34,600; Hungary 30,200. |
| Soda ash | 371,900 | 374,000 | U.S.S.R. 166,700; Czechoslovakia 37,100; Hungary 36,200. |
| Stone, sand and gravel: | | | |
| Dimension stone, worked | r 20,763 | 21,765 | West Germany 16,923; Austria 4,045. |
| Other | 7,846 | 2,397 | West Germany 1,475; Japan 922. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt, natural | 1,504 | NA | |
| Carbon black | 38,100 | 32,900 | Czechoslovakia 7,400; People's Republic of China 6,100; East Germany 5,500. |
| Coal, bituminous | 15,382 | NA | |
| Gas, natural and manufactured million cubic feet | 7,063 | 7,063 | All to Hungary. |
| Peat and briquets [8] | r 4,284 | 2,856 | All to Austria. |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | r 417 | 19 | All to Yugoslavia. |
| Refinery products: [3] | | | |
| Gasoline do | r 4,912 | 5,188 | U.S.S.R. 1,907; Greece 909; Netherlands 759. |
| Kerosine do | r 515 | 60 | U.S.S.R. 23. |
| Distillate fuel oil do | 17,712 | 16,376 | West Germany 4,799; Greece 2,874; France 1,590. |
| Residual fuel oil do | 10,753 | 11,421 | Italy 2,079; Austria 1,465; Czechoslovakia 1,005. |
| Lubricants do | 2,554 | 2,258 | U.S.S.R. 681; Poland 320; Italy 228. |
| Other: | | | |
| Mineral jelly and wax do | 106 | 83 | U.S.S.R. 24; Austria 10; Yugoslavia 9. |
| Petroleum coke do | 262 | 355 | Poland 185; Japan 66; East Germany 28. |
| Unspecified do | r 246 | 81 | NA. |
| Total | r 87,060 | 35,822 | |
| Crude chemicals from coal, gas, and oil distillation | 21,781 | NA | |

r Revised. NA Not available.

[1] Compiled from 1972 edition of Supplement to the World Trade Annual, v. 1 (Eastern Europe), Walker and Company New York, 1974 (prepared by the Statistical Office of the United Nations) unless otherwise noted. These data represent imports from Romania as reported by selected trading partner countries.

[2] Compiled from United Nations Statistical Office, World Trade Annual, 1973 ed., vs. 1–3, New York, 1975.

[3] Source: Official export statistics of Romania.

[4] Source: United Nations Economic Commission for Europe, Annual Bulletin of Steel Statistics for Europe, v. 2, 1974, New York, 1975.

[5] Includes strip.

[6] Excludes fittings.

[7] Source: Official import statistics of Poland.

[8] Source: Official import statistics of Austria.

## Table 3.—Romania: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: [3] | | | |
| Bauxite | 226,300 | 385,300 | Greece 241,300; Yugoslavia 135,500. |
| Alumina | 62,800 | 112,100 | France 40,400; Guinea 25,100; People's Republic of China 14,800. |
| Metal including alloys, unwrought and semimanufactures | 12,900 | 7,200 | West Germany 2,100; Hungary 1,800; U.S.S.R. 1,000; Italy 1,000. |

See footnotes at end of table.

## Table 3.—Romania: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Chromium, chromite [3] | 33,900 | 30,500 | Mainly from Albania. |
| Copper metal including alloys, unwrought and semimanufactures [3] | 34,700 | 44,400 | U.S.S.R. 17,400; United Kingdom 7,900; Chile 5,300. |
| Iron and steel: | | | |
| Iron ore thousand tons | 7,615 | 9,501 | U.S.S.R. 5,800; India 1,973; Algeria 1,212. |
| Pig iron, sponge iron, powder and shot do | 528 | 490 | U.S.S.R. 470; Hungary 20. |
| Ferroalloys do | 118 | 151 | U.S.S.R. 85; People's Republic of China 27; Norway 14. |
| Steel, primary forms [4] do | 280 | 323 | NA. |
| Semimanufactures: [4] | | | |
| Bars, rods, angles, shapes, sections do | 481 | 517 | NA. |
| Plates and sheets do | 348 | 341 | NA. |
| Hoop and strip do | 33 | 43 | NA. |
| Rails and accessories do | 72 | 86 | NA. |
| Wire do | 35 | 39 | NA. |
| Pipes, tubes, fittings do | 125 | 131 | NA. |
| Total do | 1,094 | 1,157 | |
| Lead: | | | |
| Ore and concentrate [5] | r 1,625 | 5,568 | All from Poland. |
| Metal including alloys, all forms | 312 | 300 | Do. |
| Manganese: | | | |
| Ore and concentrate [3] | 2,000 | 3,400 | All from U.S.S.R. |
| Oxide | 1,372 | 670 | All from Japan. |
| Mercury 76-pound flasks | 1,886 | 5,918 | All from Spain. |
| Nickel metal including alloys, unwrought and semimanufactures [3] | 2,900 | 4,700 | U.S.S.R. 1,800; Netherlands 900; United States 800. |
| Platinum-group metals, unwrought and semimanufactures value, thousands | r $412 | $1,369 | West Germany $740; Italy $230. |
| Silver metal, unwrought and semimanufactures do | r $93 | $65 | All from West Germany. |
| Tin metal including alloys, all forms long tons | 2,953 | 3,149 | People's Republic of China 1,181; United Kingdom 886. |
| Titanium oxides | 364 | 2,253 | West Germany 1,160; France 673; Italy 270. |
| Tungsten metal, all forms | 5 | 8 | All from France. |
| Zinc: | | | |
| Powder (blue dust) | 1,652 | 2,347 | Belgium-Luxembourg 1,917; West Germany 430. |
| Metal including alloys, all forms [3] | 5,700 | 9,400 | Bulgaria 3,900; Netherlands 3,300. |
| Other metals including alloys, all forms | 134 | 103 | Belgium-Luxembourg 73; France 18; West Germany 12. |
| NONMETALS | | | |
| Abrasives: | | | |
| Natural | 231 | 332 | All from Italy. |
| Manufactured [6 7] | r 1,922 | 2,573 | Austria 895; Yugoslavia 644. |
| Asbestos [3] | 42,700 | 46,600 | U.S.S.R. 22,300; Canada 12,100; United Kingdom 11,000. |
| Barite and witherite | 5,134 | 5,939 | West Germany 4,240; Italy 1,699. |
| Chalk | 777 | 1,759 | All from France. |
| Clays and clay products: | | | |
| Crude clays, n.e.s | r 31,961 | 18,290 | Greece 9,938; United Kingdom 7,679. |
| Products: | | | |
| Refractory | r 42,975 | 55,470 | U.S.S.R. 16,848; Yugoslavia 17,345; Belgium-Luxembourg 5,439. |
| Nonrefractory | r 2,119 | 391 | All from Italy. |
| Cryolite | 4,800 | 10,100 | People's Republic of China 5,000; Yugoslavia 2,500; Italy 1,800. |
| Diamond, industrial value, thousands | r $906 | $580 | All from Belgium-Luxembourg. |
| Diatomite and other infusorial earths | 495 | 593 | All from Iceland. |
| Feldspar and fluorspar | 1,086 | 1,131 | All from Italy. |
| Fertilizer materials: | | | |
| Crude, phosphatic, apatite concentrate gross weight | 404,400 | [8] 510,600 | NA. |
| Manufactured, phosphatic | 5,000 | -- | |
| Graphite | 578 | 152 | All from West Germany. |
| Magnesite, products | 19,000 | 23,400 | Czechoslovakia 12,200; U.S.S.R. 6,900; North Korea 3,100. |

See footnotes at end of table.

Table 3.—Romania: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 [1] | 1973 [2] | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Mica, worked | 20 | 10 | Switzerland 6; France 4. |
| Pigments, mineral, iron oxides | r 547 | 588 | All from West Germany. |
| Pyrites unroasted [6] | 54,000 | 43,000 | All from U.S.S.R. |
| Stone, sand and gravel | -- | 293 | All from Yugoslavia. |
| Sulfur: | | | |
| Elemental, including colloidal [3] | 39,800 | 55,100 | Poland 45,300; Yugoslavia 6,700. |
| Sulfuric acid [3] | r 63,200 | 46,000 | Hungary 23,700; Bulgaria 18,500. |
| Talc | r 250 | -- | |
| Other crude nonmetals | r 1,013 | -- | |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | 257 | 505 | France 268; United States 237. |
| Coal thousand tons | 754 | 1,356 | U.S.S.R. 472; Czechoslovakia 472; West Germany 55. |
| Coke [3] do | 2,496 | 2,965 | U.S.S.R. 1,351; Czechoslovakia 612; People's Republic of China 296. |
| Hydrogen, helium and rare gases | 398 | 185 | All from West Germany. |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 21,352 | 32,223 | Iran 15,703; Iraq 1,973. |
| Refinery products: | | | |
| Gasoline do | 6 | 28 | All from France. |
| Distillate fuel oil do | 17 | 14 | Netherlands 6; West Germany 3; United Kingdom 3. |
| Lubricants do | r 8 | | |
| Other do | r 52 | 77 | Yugoslavia 50; West Germany 25. |
| Tar and other coal–, petroleum–, or gas–derived crude chemicals [7] | r 18,853 | 1,772 | U.S.S.R. 1,509; Netherlands 263. |

r Revised. NA Not available.

[1] Compiled from Supplement to the World Trade Annual, 1972, v. 1 (East Europe), Walker and Company, New York 1974 (prepared by Statistical Office of the United Nations) unless otherwise noted. These data represent exports to Romania as reported by selected trading partner countries.

[2] Compiled from World Trade Annual, 1973, vs. 1–3, Walker and Company, New York, 1975 (prepared by the Statistical Office of the United Nations) unless otherwise noted.

[3] Official import statistics of Romania.

[4] United Nations Economic Commission for Europe, Annual Bulletin of Statistics for Europe, v. 2, 1974, New York, 1975.

[5] Official export statistics of Poland.

[6] Official export statistics of U.S.S.R.

[7] Reported as hard alloys in U.S.S.R. statistics.

[8] Official U.S.S.R. trade statistics reports exports to Romania of 589 tons.

## COMMODITY REVIEW

### METALS

Development of ferrous and nonferrous industries reportedly reached the goals foreseen by the 1971–75 5-year plan; the biggest growth-rate was in the area of iron and steel, and the aluminum industry.

**Aluminum.**—Romania has one aluminum reduction plant, with a probable productive capacity as of January 1, 1975, of 200,000 tons of primary metal per year. In 1974, production of primary metal, including alloys, was 187,000 tons, a 32.4% increase over that of 1973. The increase in production was made possible by startup of a new potline at the Slatina aluminum reduction plant. The Slatina smelter had been under continuous expansion for the past 9 years. This continued the trend of rapid growth in Romanian aluminum industry during the current 1971–75 5-year plan period, at the end of which primary metal production is slated to reach 200,000 to 208,000 tons.

Bauxite for Romania's aluminum industry is provided partly by domestic mines located in the Oradea area near Dobresti, and partly by imports. In 1973, 385,000 tons of bauxite was imported, mainly from Greece, 241,300 tons and Yugoslavia, 135,000 tons. Alumina imports in 1973 totaled 112,100 tons, including 40,400 tons from France, 25,100 tons from Guinea, and 14,800 tons from the People's Republic of China.

In 1974, Romania's estimated bauxite production was 345,000 tons, unchanged from that of 1973. Domestic and imported bauxite is converted to alumina in two plants, one located near the Oradea bauxite mines, the other in the Danube Delta near Tulçea; each plant has a productive capacity of 250,000 tons of alumina per year.

In 1974, estimated alumina production was about 374,000 tons, an increase of 32.6% over that of 1973.

In 1974, Romania exported over 90,000 tons of aluminum. Much of Romanian alumina was sent to Japan and the People's Republic of China.

Romania has a well-developed aluminum metal and alloy processing industry located near the Slatina reduction plant. The primary metal is processed into bars, tubes, shapes, sheet, strip, foil, and cables.[3]

**Copper.**—In 1974, Romania's estimated copper production was 50,000 tons, an increase of 19% over that of 1973. Romania's most important copper mines are located at Baia Mare (Cavnic, Baia Sprie), Rosia Montana, Moldova Noua, Borsa, Balan, and Lesul Ursului.

In 1974, work continued on the development of existing copper mines. Production increased at the Lesul Ursului and Moldova Noua mines. These mines represent the trend towards the utilization of large quantities of low-grade ores such as the Moldova Noua banatites with 0.23% copper content and the Rosia Poienii deposits with 0.3% copper content.

**Iron Ore.**—Romanian iron ore industry operated five mines located at Hunedoara (Teliuc, Ghelar), Cluj (Capus, Lueta), and Resica (Ocna de Fier). Because of the limited size of Romanian iron ore reserves, iron ore production will remain stationary for the current 5-year period. In 1974, Romania's estimated production of iron ore was 3.3 million tons, an increase of 0.9% compared with that of 1973.

In 1974, Romania imported 10 million tons of iron ore. In 1973, most of the iron ore was imported from the Soviet Union (5.8 million tons), and about 2 million tons from India.

**Iron and Steel.**—In 1974, Romanian steel production increased by 679,000 tons to about 8.8 million tons (planned quota was 8.628 million tons); pig iron production increased by 368,000 tons to 6.1 million tons. Expansion of the iron and steel industry's productive capacity is one of the major goals of the current 1971–75 5-year plan, with steel production targeted to reach or exceed 10 million tons per year by 1975. While no major units were commissioned during 1974, work continued on expansion of the Galati and the Hunedoara Siderurgical Combines.

**Lead and Zinc.**—In 1974, Romania's smelter lead production was an estimated 39,000 tons, unchanged compared with that of 1973; smelter zinc production was 43,000 tons, an increase of 2.4% over that of 1973. Romania's lead and zinc concentrate came mainly from the Baia Mare mining complex, Balan, and other smaller complex sulfidic ore mines. Reduction from the sintered concentrates was mainly at the Copsa Mica Imperial Smelting Process lead-zinc blast furnace plant, reportedly having a capacity of 60,000 tons of zinc and 35,000 tons of lead per year.

## NONMETALS

**Barite.**—Barite was mined at Ortra, adjacent to the Lesul Ursului copper mines. In 1974, estimated barite production was 116,000 tons. The ore mined is prepared by grinding, flotation, calcining, and micronizing. There are plans to expand processing to include gravity separation.

**Cement.**—In 1974, Romania cement production was 11.2 million tons, an increase of 13.7% over that of 1973, but down 7.6% from the 12.05-million-ton target set for the year. The 1975 plant target was 13.6 million tons.

**Fertilizer Materials.**—Fertilizer production totaled 1.4 million tons active substance, an increase of 14% over that of 1973 but short of the downward revised plan target of 2 million tons. Of the total fertilizer production, nitrogen fertilizer constituted 70.8% and phosphorus fertilizer constituted 29.2%. The increase in production was obtained mainly from new capacities.

Romania was a significant exporter of fertilizer materials with 1,284,700 tons exported in 1974.

Romania continued to concentrate on increasing its fertilizer material plant capacity. At yearend 1974, Romania's ammonia capacity was 2.1 million tons (product), with a 1.3-million-ton capacity in the planning stage. Phosphoric acid capacity was an estimated 300,000 tons (phosphorus pentoxide), with a 110,000-ton capacity in the planning stage.[4]

The Craiova industrial center for chemical fertilizers will be expanded by a major fertilizer plant complex at Tecuci. According to plans the following individual units will be built: A 300,000-ton-per-year am-

[3] Pauncev, E. (Modern Technologies at the Slatina Aluminum Works.) Metallurgia (Bucharest), v. 25, No. 12, December 1974, transl. in JPRS No. 1269. Apr. 3, 1975. p. 26.

[4] Survey of World Ammonia and Phosphoric Acid Capacities. ECN (London), v. 26, No. 658, Oct. 18, 1974, p. 79.

monia plant, based on natural gas; a 430,000-ton-per-year urea plant; a 400,000-ton-per-year sulfuric acid plant; a 110,000-ton-per-year phosphoric acid plant (phosphorus pentoxide), using the hemihydrate process, and yielding 400,000 tons per year of gypsum, to be processed into 100,000 tons per year of wallboard; a 208,000-ton-per-year diammonium phosphate plant; a 3,000-ton-per-year ammonium fluoride plant; and a 1,500-normal-cubic meter-per-hour technical oxygen plant.

Four complex fertilizer plants are now under construction in Romania by Davy Powergas Inc. Each plant has a capacity of 891,000 tons per year of product. One is located at Tirgu Mures, and was scheduled for commissioning in June 1975; one is at Craiova and was scheduled for yearend 1975; one at Turnu Magurele was scheduled for spring 1976; and one at the Arad [5] plant was scheduled for summer 1976.[6] This represents a change in policy by the Ministry for Chemical Industry towards adopting the nitrophosphate process.

At Slobozia, where a 300,000-ton-per-year ammonia plant was built by the Coppée Rust Co., a 290,000-ton-per-year granulated urea plant went onstream in 1974. The plant uses the DSM process, and nitric acid and nitrates are also produced there.

Romania and Chile have entered in a joint venture to create a $100 million ammonia-urea complex and a $65 million phosphate fertilizer plant, to be located in Chile at Cabo Negro and at the Las Ventanas copper smelter and refinery, respectively.

*Phosphatic Fertilizers.*—Romania has no phosphatic raw materials of its own and has to import all of its requirements.

In 1974, Romania imported 561,300 tons of phosphatic raw materials, mainly apatite from the U.S.S.R., an increase of 9.9% over that of 1973. In 1974, the United States and Israel delivered phosphates to Romania in amounts of 28,000 and 78,000 tons, respectively. Phosphatic materials are used mostly in complex fertilizers with recent emphasis on nitrophosphates.

At the Valea Calugareasca fertilizer complex construction has started on a 20,000-ton-per-year sodium tripolyphosphate unit.

Geomin, the Romanian State mines planning company will assist Syria in the expansion of phosphate mining operations at Knefis, which was built originally with Romanian help.

*Potassic Fertilizers.*—Romania has no potash raw material sources and imports all of its potassic requirements. In 1974, Romania imported 64,700 tons of potassic materials, an increase of 8.2% over that of 1973. Suppliers of this material were the U.S.S.R. and East Germany. The bulk of Romania's potassic materials was used in the form of complex fertilizers.

*Nitrogenous Fertilizer Materials.*—In 1974 nitrogen production was 980,000 tons, an increase of 14.8% over that of 1973. The production target for 1975 was set at 1,547,500 tons.

**Salt.**—Romania's total salt reserves exceeded 20 billion tons, and mining was mainly at 10 locations during 1974. Production was an estimated 3,923,000 tons, an increase of 19.0% over that of 1973. Romania has a well-developed sodium industry, which produced in 1974 sodium products estimated to have exceeded 1 million tons, including calcined and caustic soda, chlorine, sodium sulfate, and others. Romania helped Egypt build a sodium product plant at El Mex, near Alexandria.[7] The plant went on-stream in 1974.

## MINERAL FUELS

In Romania, production of primary energy from fossil fuels and hydroelectric sources increased from 69.8 million tons of standard fuel equivalent in 1973 to an estimated 72.7 million tons in 1974. The output of crude oil increased from 14.3 million tons to 14.5 million tons, and that of natural gas from 29.2 to 30.1 billion cubic meters. The share of these two fuels in Romania's primary energy supply declined correspondingly from 76.0% to about 74.2% during the 1973-74 period. In 1974, Romania produced 29.2 million tons of run-of-mine coal and lignite (including 8.5 million tons of coking coal). The share of coal (lignite, bituminous, and anthracite) in the primary energy supply increased from 22.8% in 1973 to about 24.3% in 1974. While the trend is to keep up present levels of crude oil production, efforts were made to increase the production rate of natural gas and coal. Romania's production of hydroelectric power increased by 12.3%.

In 1974, Romania produced 49.1 billion kilowatt-hours of electricity, 2.3% more

[5] Scînteia (Bucharest). Mar. 14, 1975, p. 3.
[6] Nitrogen (London). No. 94, March–April 1975, p. 19.
[7] Lumea (Bucharest). No. 13, Mar. 27, 1975, p. 11.

than in 1973. Thermal powerplants generated 40.6 billion kilowatt-hours (82.7%) of the electricity and hydroelectric powerplants generated 8.5 billion kilowatt-hours (17.3%). Installed capacity of electric powerplants in the country at yearend totaled 10.6 million kilowatts. In 1974, Romanian industry consumed 58.3% of the electrical energy produced.

Power exports in 1974 amounted to 3.1 billion kilowatt-hours. Exports of petroleum products reached about 6.5 million tons, a 37.2% increase; and gas exports were 205 million cubic meters.

The primary energy balance of Romania for 1973 and 1974, is shown in table 4.

**Table 4.—Romania: Total primary energy balance for 1973 and 1974**
(Million tons of standard fuel equivalent)

| Year | Total primary energy | Coal, lignite, anthracite, bituminous, and coke | Crude oil and petroleum products | Natural and associated gas | Hydroelectric power |
|---|---|---|---|---|---|
| 1973: [1] | | | | | |
| Production | 69.8 | 13.0 | 19.1 | 36.8 | 0.9 |
| Imports | 10.6 | 3.7 | 6.5 | -- | .4 |
| Exports | 7.1 | -- | 6.4 | .3 | .4 |
| Apparent consumption | 73.3 | 16.7 | 19.2 | 36.5 | .9 |
| 1974: [2] | | | | | |
| Production | 72.7 | 14.3 | 19.4 | 37.9 | 1.1 |
| Imports | 11.9 | 3.7 | 7.8 | -- | .4 |
| Exports | 10.4 | -- | 9.7 | 3 | .4 |
| Apparent consumption | 74.2 | 18.0 | 17.5 | 37.6 | 1.1 |

[1] Production data for 1973 and 1974 taken from the Statistical Yearbook of the Socialist Republic of Romania (Bucharest), 1974 and 1975; trade data from Foreign Trade of the Socialist Republic of Romania (Bucharest) 1973.
[2] Production data reported in Scinteia (Bucharest) Mar. 11, 1975 and in other Romanian sources.

**Coal.**—Romania's rapid industrial expansion required further development of its coal industry. In 1974, Romania's three major and several smaller coalfields produced 29.2 million tons of run-of-mine coal including anthracite and bituminous coal (8.5 million tons), brown coal (683,000 tons), and lignite (20 million tons); this was not significant even by regional standards, but important for Romania's economy. About 68.5% of all coal was surface mined. Run-of-mine coal production fell short by 10.8% of the plan target for 1974, which was 32.5 million to 33.0 million tons.

Romania's bituminous coal was mined mainly (96%) in the Valea Jiului coal fields, with the rest coming from the smaller Anina coal fields. In all, 14 coal seams were mined; most workings were of the longwall type, and were at depths of up to 1,500 feet.

Romania's total lignite reserves are estimated at 3 billion tons.[8] This total includes 2 billion tons of minable reserves of which 1.24 billion tons are suitable for strip mining and are located south of the Carpathian chain between the Danube and the Oltet Rivers. The region includes the Rovinari, Motru, and Jilt Basins, where a total of 11 strip mines are operated.

**Natural Gas.**—Romania produced 1.1 trillion cubic feet of natural gas, a 2.9% increase over that of 1973. Of this quantity 208 billion cubic feet was associated gas. Romania produced also an estimated 17.1 billion cubic feet of manufactured gas, (coke oven and blast furnace gas), 11.9% less than that in 1973.

Romania's natural gas reserves are estimated at 280 billion cubic meters,[9] and are located in a large kidney-shaped area near the center of the Transylvanian Basin (Tirgu-Mures, Turda, Copsa, Mica, and Fagaras).

Romania will contribute convertible currency for buying equipment for the COMECON gas pipeline, to be built by 1978, and which will run from the Orenburg (U.S.S.R.) gasfields to the Western border of the Soviet Union.

Natural gas is the basis of a well-developed petrochemical industry in Romania. Exploration for hydrocarbons had a high priority with about 310 million lei earmarked for this purpose, an increase from 300 million lei in 1973. Exploratory drilling during 1974 was about 180,000 meters,

[8] Popa, A., and D. Fodor. Der Braunkohlentagebau in der Socialistischen Republik Rumänien (Brown Coal Mining in the S.R. Romania). Neue Bergbautechnik (Leipzig). V. 3, No. 10, October 1973.
[9] World Oil. V. 177, No. 3, Aug. 15, 1973, p. 118.

an increase of 10,000 meters over that of 1973. Twenty-two new natural gas structures were discovered compared with 16 new structures discovered in 1973.

In 1974, Romania had natural gas pipelines totaling 6,500 kilometers in length. Turbo compressor units with a total capacity of 36,000 horsepower were used to transport the gas. The pipelines interconnect all major industrial consumers with the gasfields. One pipeline connects the Romanian gasfields to Hungary and is used to export 200 million cubic meters of natural gas per year.

**Petroleum.**—In 1974, Romania produced 14.5 million tons of petroleum or about 0.6% of world output, an increase of 199,000 tons over that of 1973. Output exceeded slightly the plan target of 14.4 million tons for the year. The country continued to increase its imports of crude oil from the Middle East. Total imports of crude oil were 4.5 million tons in 1974, an increase from 4.1 million tons in 1973. Exports of petroleum products were 6.5 million tons. This helped to provide some convertible currency needed for importing industrial equipment from the West.

In 1974, three main oilfields were exploited; the Prahova Valley oilfield (Ploieste, Pitesti, Tirgoviste, and Telejean), that on the Moldavian slopes of the Carpathian mountains (Bacau), and the one in the West Carpathian region. There were about 7,000 oilwells and 250 drilling rigs in operation in 1974. In 1974, Romania was also an important exporter of petroleum drilling equipment with exports to 25 countries totaling 500 million lei, 13% of Romania's equipment exports.[10]

Exploraton efforts continued for new oilfields during 1974. Exploratory drilling was reportedly 840,000 meters, compared with 830,000 meters in 1973. The number of petroleum deposits discovered during the year was about 17, up from 14 in 1973. Funds allocated and spent for exploration were about 19 billion lei, unchanged from that in 1973. At present there are over 70 wells deeper than 4,000 meters, with the deepest well, Ghergheasa No. 922 at 6,204 meters in depth.[11]

The first offshore drilling platform to be used in the Black Sea was under construction by Romanian companies and it was slated to be completed before yearend 1975.

The Romanian petrochemical industry continued its vigorous expansion. A new 50,000-ton-per-year dimethyl-terepthalate plant was commissioned at the Brazi-Ploiesti petrochemical combine. Design was by Krupp Chemieanlagebau of West Germany using the Witten process developed by Dynamit Nobel AG.[12] Besides these, 21 other petrochemical plants were in various stages of construction.

**Other Fuels and Energy.**—Among Romania's less important sources for the energy economy in 1974 were hydroelectric power, nuclear energy, oilshale, and tar sands.

*Hydroelectric Power.*—In the overall energy economy, water power is of relatively small but increasing significance. Hydroelectric powerplants supplied 8.5 billion kilowatt-hours or 17.3% of all electric power generated in Romania in 1974, compared with 14.2% in 1973. At yearend 1974, total capacity of electric powerplants reached 10.6 million kilowatts, of which some 2.4 million kilowatts represented hydroelectric capacity. Installed capacity of hydroelectric powerstations was to increase by 250 megawatts in 1975. During the next 5-year plan of 1975–80, installed capacity is to increase by 30% to 39%.

*Nuclear Power.*—Agreement was signed in Moscow with the Soviet Union for construction of a 440-megawatt nuclear powerstation in Romania. Design will be a joint undertaking, while basic equipment will come from the Soviet Union. At present Romania has no atomic energy plant.[13]

*Oilshale.*—Construction started on an oilshale-fueled 990-megawatt powerplant at Oravita. Three 330-megawatt units are planned with an 8-kilometer-long conveyor belt to feed the plant oilshale.[14] A nearby open pit mine under development will supply more than 12 million tons of oilshale per year.

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[10] Constructia de Masini (Bucharest). No. 2–3, February-March 1975, pp. 95–97, transl. in JPRS 64891, June 2, 1975, p. 65.

[11] Paraschiv, D. Contributia Cercetarilor Geologice si Geofizice la Dezavoltarea Industriei Extractive de Petrol si Gaze din Romania (Contribution of Geological and Geofisical Exploration to the Development of the Extractive Industry of Oil and Gas in Romania) Mine, Petrol si Gaze (Bucharest). V. 25, No. 8, 1974, pp. 372–377.

[12] New DMT Plant for Romania. European Chemical News (London). V. 25, No. 649, Aug. 23, 1974, p. 6.

[13] Román Atomerömü Szoviet Kozremüködéssel (Romanian Atomic Plant With Soviet Cooperation). Világgazdaság (Budapest). V. 7, No. 12, Jan. 18, 1975, p. 2.

[14] Energie Electrica din Schisturi Bituminoase (Electric Power From Bituminous Schists). Scînteia (Bucharest). V. 44, No. 10093, Feb. 2, 1975, p. 1.

# The Mineral Industry of Sierra Leone

By Janice L. W. Jolly [1]

The Mineral industry of Sierra Leone continued to contribute around 69% to the total value of exports. Diamond was the nation's principal mineral export and formed greater than 80% of the total value of mineral exports. Significant quantities of iron ore and bauxite also were mined and exported in 1974. Sierra Leone ranks seventh in world production of diamond.[2] A reduction in diamond and iron output was forecast by the new 5-year plan [3] (1974-79), but was anticipated to be largely compensated by increased bauxite and rutile sales. The depressed state of the diamond industry had an adverse effect throughout 1974 on all sectors of trade within the country. Sierra Leone is a member of the International Bauxite Association (IBA) and was expected to join the Iron Ore Exporters Association in early 1975. Higher bauxite levies were set in 1974 by half the 10-nation IBA, including Sierra Leone.

A positive balance of payments was last achieved in 1972; in 1973–74 increased prices for imported oil and rice helped to produce trade deficits. In an effort to preserve foreign exchange, the Government introduced an exchange control order requiring residents of Sierra Leone to surrender all funds held abroad as specified in the order. Some foreign nationals employed in Sierra Leone were exempt.[4]

The Government mining policy was reaffirmed to be that of acquiring controlling interest in large mining enterprises with negotiations geared to individual circumstances. The strategy of mining sector development under the 5-year plan has three main objectives: (1) To progressively increase export earnings while reducing excessive dependency on diamond, (2) to establish mineral processing industries, and (3) to increase national participation in the mining sector. Even so, the new plan envisages an annual average growth rate of 6.2% (compared with the current 4.3%) and an aggregate investment during the period estimated at $735.1 million.[5]

About 45.6% of the capital for the 5-year plan will be derived from public sources and about 54.4% from private sources. Of the public investment, about 51.1% will be financed from domestic sources and 48.9% from foreign aid (official loans and grants). Both mining and agriculture will receive large allocations. Mining will receive $108.4 million, or 14.8% of the budget. The Government floated two new development stock issues totaling $5.9 million to finance development projects and help launch the new 5-year plan.

The plan envisages establishment of a sizable diamond cutting and polishing industry and of an alumina plant. Resumption of offshore exploration for petroleum will be encouraged. The capabilities of the Ministry of Mines for systematic surveying, prospecting, and evaluation of mineral resources will be increased by expansion of the Geological Survey. Much detailed geologic information is presently derived from prospecting and deposit evaluation done by mining companies. To safeguard the national interest, the legal staff of the Ministry of Mines was to be strengthened to ensure that all mineral resource information is made available to

[1] Physical scientist, Division of Ferrous Metals.
[2] Industries et Travaux D'Outremer (Paris). Le Marche Mondial du Diamant (World-Wide Market of Diamond). V. 23, No. 254, January 1975, p. 50.
[3] Sierra Leone Ministry of Development and Economic Planning (Freetown). Sierra Leone National Development Plan, 1974/75–1978/79, p. 48.
[4] Standard and Chartered Review (London). Sierra Leone. January 1975, p. 39.
[5] Where necessary values have been converted from Leones (Le) to U.S. dollars at the rate of Le1=US$1.18.

the Government. During the plan period, geological exploration will concentrate on the Kambui, Nimini, and Gori Hills schist belts of the Sula Mountains, where iron, copper, nickel, gold, molybdenum, lead, and zinc occurrences have been reported.

The Sierra Leone Geological Survey has proposed airborne geophysical exploration in the Sula Mountain area where a ground reconnaissance survey was recently done. A cassiterite occurrence in the Kalangbe area of Northern Province, and a small, irregular chromite deposit near Kenema in Southeastern Province were also being studied. A revival of gold mining was also being considered. Prospecting by Sierra Leoneans and small-scale mining will be encouraged through technical and financial assistance. A laboratory for testing mineral samples and a Planning and Economic Analysis Unit were also planned for the Department of Mines.

An allotment of $45.1 million under the 5-year plan was for hydroelectric expansion. The principal goal is a 46-megawatt hydroelectric plant to begin the Bumbuna hydroelectric project. The Bumbuna project was expected to be of importance to possible future growth of both the bauxite and iron industries. The first phase will become operational after 1978 with an estimated capital expenditure of about $37 million. Additional projects include a 3.5-megawatt hydroelectric plant near Dodo in the Kenema District, and a 10-megawatt generator and other inprovements in Freetown. These projects will bring the installed electrical capacity of the country to a total of 43.6 megawatts by 1977, not including the generating capacities of the mining companies.[6] Production, transport, and distribution of electricity was by the Sierra Leone Electricity Corporation (SLEC). Government control was permitted by the Electricity Corporation Act of May 3, 1974. Eighty percent of the electricity is consumed in Freetown. Execution of the Bumbuna hydroelectric project will be given to a separate semiautonomous authority with arrangements to coordinate activities with the SLEC and for takeover of the project by the SLEC after construction. The National Hydrological Decade Committee will be revitalized in the first year of the plan, prior to an Act of Parliament establishing a Natural Resources Agency to regulate and coordinate water resource utilization and to be responsible for designing hydroelectric facilities.

The Mano River Declaration signed on October 4, 1973, by Sierra Leone and Liberia related to economic union between the two countries. The first phase relating to goods of local origin is to be completed by the end of 1976. A draft treaty to create the Economic Community of West African States (ECOWAS) was scheduled for approval by delegates of 15 countries to a ministerial conference in early 1975. Ratification by seven States will bring ECOWAS into existence. Development aid was being given by the African Development Bank, the Federal Republic of Germany, the U.S. Government, the United Nations Development Program (UNDP), North Korea, Romania, and the People's Republic of China (PRC). Romania is providing Sierra Leone with agricultural machinery and fertilizers and a team of experts who will investigate mineral resources as part of an aid program. PRC assistance includes a geological exploration program and the hydroelectric scheme at Dodo.

## PRODUCTION AND TRADE

Mineral commodities produced by Sierra Leone in 1974 were valued at an estimated $103 million (not including petroleum refinery products), compared with an estimated $109.6 million in 1973. Mineral production figures are shown in table 1. A reduction in diamond output of 22% by 1979 was forecast by the 5-year plan [7] with export earnings stabilizing to around $74.1 million in 1978–79. Exports of iron ore were also projected to decrease by 20% over the plan period. By 1979, exports of bauxite, rutile, and ilmenite were expected to comprise 33.6% of the total value of mineral exports compared with 5.1% in the base 1973–74 year.

Diamond marketing conditions were abnormally strong in 1973, but the world diamond market took a downturn in early 1974 and at yearend trading conditions were still depressed. A lower unit price

[6] Page 49 of work cited in footnote 3.
[7] Work cited in footnote 3.

was earned in the first 10 months of 1974, when 844,398 carats valued at $37.7 million were exported, compared with 508,769 carats, valued at $32.9 million, for the same period in 1973.[8] Diamonds exported in 1974 were valued at approximately $87.4 million compared with an estimated $93.7 million for all of 1973. Most diamond exports went to the United Kingdom and Western Europe.

Next in importance were diamond exports to Asia, the Far East, and North America. Imports of most items were from the same places, but Asia formed a larger share of the market. Exports and imports are shown on tables 2 and 3, respectively.

Although the target for 1974 was 720,000 tons, and the same amount exported, bauxite production for the first 6 months of 1974 was down and was valued at $1,097,000, compared with $2,233,710 for the same period in 1973 and a total $4,109,940 for all of 1973.[9] A stepup in bauxite exports from the present 5.1% of the mineral export market to 12% of the total value of mineral exports was planned by 1979.

During the first 6 months of 1974, 9,793,446 imperial gallons of distillate fuel oil and 540,123 imperial gallons of jet fuel and kerosine were exported from the refinery at Freetown. Crude oil was supplied by Nigeria, the Netherlands-West Indies, Trinidad and Tobago, Kuwait, Italy, and the United Kingdom. The published capacity of the Freetown refinery is 10,000 barrels per day of crude oil.

[8] Standard and Chartered Review (London). Sierra Leone. February 1975, p. 42.
[9] Standard Bank Review (London). Sierra Leone. December 1974, p. 38.

**Table 1.—Sierra Leone: Production of mineral commodities**

| Commodity[1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| Aluminum, bauxite, gross weight | thousand metric tons | [r] 694 | 603 | 672 |
| Diamond: | | | | |
| Gem | thousand carats | 720 | 646 | 670 |
| Industrial | do | 1,080 | 758 | 1,000 |
| Total | do | 1,800 | 1,404 | 1,670 |
| Iron ore, gross weight | thousand metric tons | 2,321 | 2,405 | 2,014 |
| Petroleum refinery products: | | | | |
| Gasoline | thousand 42-gallon barrels | 405 | 350 | 369 |
| Jet fuel | do | 137 | 119 | 144 |
| Kerosine | do | 140 | 144 | 153 |
| Distillate fuel oil | do | 503 | 496 | 469 |
| Residual fuel oil | do | 804 | 846 | 536 |
| Other | do | 13 | 87 | 12 |
| Refinery fuel and losses | do | 192 | 204 | 68 |
| Total | do | 2,194 | 2,246 | 1,751 |

[p] Preliminary. [r] Revised.
[1] In addition to the commodities listed, a variety of crude construction materials (clays, sand, gravel, and stone) are produced, but quantities are not reported and available general information is inadequate for the formulation of reliable estimates of output levels. Also, a very limited production of gold may occur but again data are not available and no basis is available for reliably estimating this production. In addition, Sierra Leone annually refines 4,000 to 10,000 metric tons of salt from imported crude marine salt, but this is not included in the body of the table because it would represent a double counting of material credited to the country where the salt was originally collected.

## Table 2.—Sierra Leone: Exports and reexports of selected mineral commodities
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| Abrasives, natural, n.e.s., dust and powder of precious and semiprecious stones, including diamond dust | value | $1,287 | -- |
| Aluminum: | | | |
| Bauxite | thousand tons | 694 | 663 |
| Semimanufactures | | -- | (1) |
| Cement, hydraulic | | 20 | 86 |
| Diamond: | | | |
| Uncut and unworked | thousand carats | 1,838 | 1,398 |
| Cut and polished | do | 8 | 5 |
| Iron and steel: | | | |
| Ore and concentrate | thousand tons | 2,321 | 2,405 |
| Semimanufactures | | 34 | 3 |
| Petroleum refinery products: | | | |
| Gasoline | thousand 42-gallon barrels | 34 | (1) |
| Kerosine and jet fuel | do | 83 | 57 |
| Distillate fuel oil | do | 1,037 | 958 |
| Lubricants | do | 2 | 1 |
| Stone, sand and gravel | | 12 | 1,254 |
| Other, ferrous and nonferrous metal scrap | | 11,469 | 3,471 |

[1] Less than ½ unit.

## Table 3.—Sierra Leone: Imports of selected mineral commodities
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal, including alloys, all forms | | 151 | 289 |
| Copper metal, including alloys, all forms | | 30 | 30 |
| Iron and steel: | | | |
| Ore and concentrate | | 61 | 197 |
| Primary forms and semimanufactures | | 13,363 | 15,634 |
| Lead metal, including alloys, all forms | | 42 | 41 |
| Silver, unworked or partly worked | value | $573 | $2,398 |
| Tin metal, including alloys, all forms | long tons | 9 | 5 |
| Zinc metal, including alloys, all forms | | 15 | 10 |
| Other metals, including alloys: | | | |
| Pyrophoric alloys | | NA | 9 |
| Base metals, including alloys, all forms, n.e.s | | NA | (1) |
| NONMETALS | | | |
| Abrasives: | | | |
| Natural, n.e.s., dust and powder of precious and semiprecious stones, including diamond | value | $332 | $290 |
| Grinding and polishing wheels and stones | do | $5,865 | $2,818 |
| Cement, hydraulic | | 70,842 | 83,045 |
| Clay products: | | | |
| Refractory (including nonclay bricks) | | 16 | 1,288 |
| Nonrefractory | | 35 | 413 |
| Fertilizer materials, crude and manufactured | | -- | 4,479 |
| Gypsum and plasters | value | NA | $1,057 |
| Lime | | 201 | 253 |
| Salt | | 8,617 | 8,701 |
| Sodium compounds, n.e.s., caustic soda | | 130 | 552 |
| Stone, sand and gravel | | 313 | 591 |
| Sulfuric acid | | 67 | 157 |
| Other: | | | |
| Crude nonmetallic minerals | | 26 | 23 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | | NA | 697 |
| Nonmetallic mineral manufactures, n.e.s | | NA | 58 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | | 6 | 306 |
| Coal, coke, briquets | | 9 | -- |
| Petroleum: | | | |
| Crude and partly refined | thousand 42-gallon barrels | 2,196 | 1,981 |
| Refinery products: | | | |
| Gasoline | do | 107 | 21 |
| Kerosine and jet fuel | do | (1) | (1) |
| Distillate fuel oil | do | 70 | 273 |
| Lubricants | do | 4 | 33 |
| Other: | | | |
| Liquefied petroleum gas | do | 5 | 5 |
| Mineral jelly and wax | do | 4 | 9 |
| Asphalt, bitumen, and petroleum coke | do | NA | 16 |
| Unspecified | value, thousands | NA | $98 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | 463 | 592 |

NA Not available.
[1] Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Bauxite.**—An alumina plant is planned for the Port Loko Area, scheduled for completion in 1981. The new 5-year plan allotted $47.2 million for the project. The total cost of the plant is estimated at $129.8 million pending completion of feasibility studies. A second mine with an annual output of 1.5 million tons was expected to become operational in the Port Loko Area by 1976–77. Total reserves of bauxite are estimated to exceed 30 million tons with 50% to 60% $Al_2O_3$. These are concentrated in the Mokanji Hills near Moyamba and have been mined since 1963 by the Sierra Leone Ore and Metal Company Ltd. (SIEROMOCO), a subsidiary of Suisse Aluminium Industries AG of Switzerland. Besides the reserves being mined at Mokanji and the earlier discovered deposit of the Gbonge Hills, those located in the Pujehun District comprise 2 million tons of 53% $Al_2O_3$ and 7% $SiO_2$. Aluminous laterite also occurs in the vicinity of Waia in Koinadugu District near Bumbuna, the site of planned hydroelectric expansion. This deposit contains 30% to 40% alumina and less than 7% silica. Other potential deposits are known in the Rokel River Group sediments and the ferruginous laterites north of Mabole and in Kukuna-Konta.[10]

**Gold.**—Seventeen chiefdoms have been declared gold-mining areas by the Ministry of Mines. One-year alluvial gold mining licenses were granted to nine Sierra Leoneans. Two U.S. citizens who had obtained gold buyer's and exporter's licenses were grubstaking these miners. An alluvial gold mining license can be granted only to a citizen resident in the declared area, or to a citizen approved by the Chiefdom Council of the declared Chiefdom. The Government charges a 9% royalty on gold exported from Sierra Leone. Only two rather small shipments were reported in 1974. Gold was discovered in 1926 and produced from 1930 until 1957 when the Alluvial Diamond Mining Scheme started and attention was diverted. Since then there has been little production. The two gold shipments in 1974, reportedly totaling 83 troy ounces, formed the first legitimate exports of gold since 1964.[11] The main producing areas were Dalakuru in the Northern Sula Mountains, the Matina-Yirisen Area and Makong in the schist belt, and Baomahun at the southern end of the Kangari Hill.

**Iron Ore.**—Average grade of concentrates from the Marampa Mine was 63.6% iron. The concentrator at the mine was modified in 1973, and a dam to store water was completed. A new tailing pumphouse was planned for 1974. The reserves were estimated at 67 million tons of 38% iron. The laterite red ore cap has been exhausted. The Tonkolili iron deposits have estimated reserves of 124 million tons of 55% to 56% iron. Other deposits are located at Bagla Hill in the Gola Forest Area of Southeastern Province where assays of the gneissose, magnetite-bearing ironstone with laterite capping indicate an average iron content of 40%. East of Kale Mabesi in the Pujehun District, ridges of a residual accumulation of magnetite blocks have been traced for 2½ and 4 miles. Nine million tons of residual material is estimated to a depth of 30 feet, and about 250,000 tons of primary ore per foot of depth is estimated below this.[12]

PRC geologists were reportedly examining iron deposits in the Tonkolili District, presently under concession to the British-owned Sierra Leone Development Co. (DELCO). The U.S. Bethlehem Steel Corp. continued investigation of the iron ore deposits at Bagla and was reportedly interested in a joint mining operation with DELCO.

**Titanium Minerals.**—The agreement reached in 1973 between two West German companies, Bayer Aktiengesellschaft and Preussag Aktiengesellschaft (Bayer-Preussag), and the Sierra Leone Government was ratified by Parliament in May 1974 and allowed for a 5-year special exclusive prospecting license in a 2,600-square-mile area of Southern Province. Bayer-Preussag has the right to obtain any amount of titanium minerals for the purpose of testing for commercial operation. The firm has been conducting surveys in Sierra Leone since October 1970 and will spend $590,000 over the next 5 years.[13]

[10] Ministry of Lands and Mines. Report of the Mines Division (Freetown). Sierra Leone Govt. Printing Dept., 1970, pp. 12–13.
[11] U.S. Embassy, Freeport, Sierra Leone. State Department Airgram A–46, May 16, 1974, 2 pp.
[12] Page 13 of work cited in footnote 10.
[13] U.S. Embassy, Freeport, Sierra Leone. State Department Airgram A–43, May 16, 1974, 13 pp.

Rutile deposits have been located along the coast in Moyamba, Bonthe, and Pujehun Districts. A high proportion of the rutile is embedded in laterite, and extraction has proven to be costly. Rutile deposits in the Bonthe and Moyamba Districts have been estimated to contain about 11 million tons of 0.75% to 1.0% rutile.

During 1973, Bethlehem Steel Corp. replaced Armco Steel Corp. as the major shareholder in Sierra Rutile Ltd. (SRL). The Nord Resources Co. of the United States, holding 20% of SRL, is the managing company and is in charge of prospecting operations in a concession near Gbangbama. A pilot plant was constructed for designing a wet processing system. A large proportion of the deposit is under the water table, and experiments with pumping the water out were being made. At yearend, negotiations were in process between the Government and Bethlehem Steel. A 1977 production date was anticipated. The 5-year plan predicts the sales of rutile will account for 21% of all mineral exports by 1978–79. The last rutile production was in 1971.

Ilmenite and titaniferous magnetite deposits are also known in Sierra Leone.[14] Ilmenite occurs in the gabbro-norite complex of the peninsula, and as alluvial concentrations in beach sands between Tokeh and York and in the Whale River Estuary. Massive ilmenite and titaniferous magnetite deposits in the vicinity of Grafton and Hastings have also been examined by mining concerns. Ilmenite beach sands occur in the Lake Mabesi Area and at Shenge.

## NONMETALS

**Diamond.**—Early in 1974, the Government announced that five diamond firms of international standing would be licensed to purchase and export diamond in competition with the Diamond Corporation of West Africa Limited (DICORWAF), a part of the De Beers Central Selling Organization. Even so, DICORWAF appeared to be buying the same amount as before. The Government Diamond Office (G.D.O.) is managed by DICORWAF. Diamond production by the National Diamond Mining Company (Sierra Leone) Ltd. (DIMINCO) was depressed during 1974, reflecting the fact that reserves were being steadily depleted. DIMINCO was granted a prospecting license for a large area in Southern Province southwest of Bo. A comprehensive review of the history, geology, and geomorphology in the diamond mining fields of Sierra Leone was made by the Sierra Leone Geological Survey in 1968.[15]

## MINERAL FUELS

**Petroleum.**—All 1970 concessions granted to Occidental Petroleum Corp. and the Interocean-Union Carbide-Clinton International Group ended during 1973. When these firms relinquished their offshore licenses, the Damson Oil Corp.-Aracca Petroleum Co.-Plannet Oil Group remained the only concession holder in the country. There was no drilling or exploration activity reported.[16] The Damson Oil Corp. and Aracca Petroleum Co. were granted a joint concession in 1972 covering 1.28 million acres. Under a recently signed trade agreement with Romania, an oil exploration team was expected to begin an investigation of Sierra Leone's oil potential.

Plans were disclosed[17] for the purchase of a $354,000 liquid petroleum gas plant which will produce 1,500 tons of gas annually. During 1973, natural gas was imported from Liberia and France.

[14] Ministry of Lands and Mines. Report of the Mines Division (Freetown). 1970. Sierra Leone Govt. Printing Dept. 1970, 29 pp.

[15] Hall, P. K. The Diamond Fields of Sierra Leone. Sierra Leone Geol. Survey Bull., v. 1, No. 5, 1968, 133 pp.; v. 2, Maps.

[16] Biro, Philippe. Petroleum Developments in Central and Southern Africa in 1973. AAPG Bull., v. 58, No. 10, 1974, p. 2062.

[17] Standard Bank Review (London). Sierra Leone. August 1974, p. 15.

# The Mineral Industry of the Republic of South Africa

By James H. Jolly [1] and Charles W. Sweetwood [2]

The mineral industry of the Republic of South Africa achieved a record high in mineral output value in 1974. Sales of mineral commodities, including gold and diamond, totaled $5.8 billions,[3] 41% more than the record set in 1973. The main factors in setting the new high were soaring gold prices, increased demand for platinum by the automobile industry, and continued strong world demand for industrial minerals and metals.

The South African economy performed well in 1974, although economic growth slowed in the last quarter. The gross national product (GNP) was up 9%, and the gross domestic product (GDP) increased 7.2%. The metals and minerals industry contributed an estimated 17.4% to the GDP, which increased from $27.2 billion in 1973 to $32.9 billion in 1974. For the year, the value of imports outstripped exports, even including the vastly higher revenue from gold, and resulted in a current account deficit of $1.3 billion; however, this was counterbalanced to a large extent by a $1.1 billion inflow of capital. Gold and foreign exchange holdings declined slightly, and at yearend were valued at $1.7 billion.

The Government continued major programs to increase mineral exports and to attain greater self-sufficiency. Development of both the Sishen-Saldanha Bay and Richards Bay projects continued on schedule, and both harbors were expected to be ready for large-scale mineral exports in 1976. Construction of large new coal-fired powerplants, mainly in the Transvaal, continued; these plants were expected to provide the electrical power necessary for developing new mines and for increased domestic processing of minerals. In 1974, the mining industry and the iron, steel, and base metals industries were the largest customers of the Electricity Supply Commission (ESCOM), purchasing 32.2% and 30.7%, respectively, of all units sold. Late in the year the Government decided to go ahead with plans to construct a large-scale uranium enrichment plant using new technology. A $115 million pilot enrichment plant, completed in 1974, was evaluating the process. Although the energy crisis did not appreciably affect the South African economy in 1974, the Government announced plans to construct a second, much larger, oil-from-coal conversion plant to lessen the country's total dependence on imported oil. Programs to stockpile additional oil in old coal mines also continued.

The mining industry continued to experience significant increases in production costs due to general inflation and large wage increases. Wages paid to black workers, for example, increased to more than four times those paid prior to May 1973. Average underground wages for black workers in gold mines at yearend were $125 monthly plus free board and room. The average number of workers employed at all mines in the Republic of South Africa fell by 10,000 in 1974 to 666,693. Late in the year strikes and tribal violence at some mines disrupted production schedules and caused some workers to return

[1] Physical scientist, Division of Nonferrous Metals.
[2] Regional minerals officer, U.S. Consulate General, Johannesburg, Republic of South Africa.
[3] Where necessary, values have been converted from South African rand (R) to U.S. dollars at a rate of R1=US$1.471 (average of monthly averages as given in volumes 27 and 28 of International Financial Statistics.) The rate for 1973 was R1=US$1.445.

home after their contracts expired. Faced with rising labor costs and labor problems, the South African Chamber of Mines embarked on a $220 million research and development program to bring gold mining technology to a level comparable with that in other mining industries. Much of the effort of the program was aimed at improving productivity through mechanization.

In the metals sector, Palabora Mining Co. (PMC) announced a $100 million expansion program to increase copper production by 1977 despite a slowing of world demand for copper after midyear. Plans for a new electrolytic copper refinery near Cape Town, however, were deferred. Base metal exploration in northern Cape Province continued. Phelps Dodge Corp. was pilot-plant-testing bulk ore samples from its two large copper-lead-zinc-silver deposits near Aggeneys; however, a decision to bring the deposits into production was deferred until economic conditions improve. Gold production continued to decline, but output value increased dramatically, accounting for almost 67% of South Africa's mine production value in 1974. Development of several new gold mines was planned. Expansion in the iron and steel industry continued. In March, the Newcastle works of the South African Iron and Steel Industrial Corp. Ltd. (ISCOR) poured its first liquid steel. Plans to construct two major ferroalloy facilities in the Transvaal were announced. A new vanadium pentoxide producer came onstream in July. Zinc production doubled, and zinc refining capacity was to be increased by 50%.

In the nonmetals sector, production and value of diamond decreased as demand fell in the second half of the year following record sales in the first half. Fluorspar production declined slightly, but additional production capacity was planned. Production of phosphate ores increased fourfold in 1974, and more capacity was planned.

In the fuels sector, coal mining operations were expanding to meet increasing domestic and export requirements. Additional coal export contracts were signed, but exports would not begin until the completion of facilities at Richards Bay. The search for domestic petroleum continued both onshore and offshore with negative results. Gas shows in a well off the Orange River mouth, however, were encouraging, and more exploration activity in that area was planned in 1975.

## PRODUCTION

Total value of mineral production increased 38% (in terms of rands) over that of 1973. Value of production and/or sales, including uranium and platinum listed under ores and minerals in official statistics, was as follows:

| Commodity | Value (thousand dollars) | |
|---|---|---|
| | 1973 | 1974 |
| Gold | 2,585,524 | 3,853,745 |
| Silver | 10,594 | 12,073 |
| Diamond | 234,620 | 210,444 |
| Ores and minerals: | | |
| Local sales | [1]518,860 | 662,816 |
| Exports | 760,697 | 1,039,841 |
| Total | 4,110,295 | 5,778,919 |

[1] Data differ from that shown on table 5 because of difference in source.

In terms of quantity, production of most mineral commodities increased during the year, particularly chrome, iron and manganese ore, nickel, platinum-group elements, zinc and zirconium concentrates, Cape Blue crocidolite, coal, phosphate ores, vermiculite, clays, and stone. Significant decreases in output were registered by gold, silver, uranium, and anthophyllite. Gold (and byproduct uranium) continued to decline because lower grade ores were mined to take advantage of high gold prices.

## Table 1.—Republic of South Africa: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| METALS | | | |
| Aluminum, smelter | 52,900 | 52,800 | 75,000 |
| Antimony concentrate: | | | |
| Gross weight | 24,109 | 25,870 | 25,212 |
| Metal content | 14,571 | 15,700 | e 15,300 |
| Beryllium, beryl concentrate, 11% to 12% BeO | 250 | 52 | 4 |
| Chromium, chromite, gross weight: | | | |
| More than 48% $Cr_2O_3$ | 48,404 | 30,120 | 20,531 |
| 44% to 48% $Cr_2O_3$ | 977,812 | 957,783 | 938,573 |
| Less than 44% $Cr_2O_3$ | 456,943 | 661,727 | 917,809 |
| Total | 1,483,159 | 1,649,630 | 1,876,913 |
| Columbium-tantalum concentrate kilograms | 240 | -- | -- |
| Copper: | | | |
| Mine output, metal content | 161,927 | 175,797 | 179,111 |
| Metal: | | | |
| Smelter | 167,800 | 150,400 | 142,200 |
| Refined | r 79,300 | 90,600 | 85,500 |
| Gold, primary thousand troy ounces | 29,245 | 27,495 | 24,386 |
| Iron and steel: | | | |
| Iron ore and concentrate thousand tons | 11,223 | 10,955 | 11,553 |
| Pig iron do | r 4,409 | 4,331 | 4,621 |
| Ferroalloys do | 490 | 556 | 637 |
| Crude steel do | 5,340 | 5,628 | 5,626 |
| Iron and steel semimanufactures: | | | |
| Cast iron and steel do | 380 | 523 | 546 |
| Rolled products do | NA | NA | NA |
| Lead, mine output, metal content | 137 | 1,623 | 2,937 |
| Manganese ore and concentrate, gross weight: | | | |
| Metallurgical: | | | |
| Over 48% Mn | 743,467 | 934,983 | 1,138,323 |
| Over 45% to 48% Mn | 116,509 | 278,193 | 218,185 |
| Over 40% to 45% Mn | 174,607 | 246,443 | 264,464 |
| Over 30% to 40% Mn | 2,142,653 | 2,629,137 | 3,026,152 |
| Subtotal | 3,177,236 | 4,088,756 | 4,647,124 |
| Chemical: | | | |
| Over 65% $MnO_2$ | 7,999 | 8,203 | 4,996 |
| Over 35% to 65% $MnO_2$ | 86,263 | 78,671 | 93,266 |
| Subtotal | 94,262 | 86,874 | 98,262 |
| Total | 3,271,498 | 4,175,630 | 4,745,386 |
| Manganiferous iron ore, 15% to 30% Mn, 20% to 35% Fe | 101,657 | 66,527 | 89,602 |
| Nickel: | | | |
| Mine output, metal content | 11,656 | 19,426 | 22,100 |
| Electrolytic metal | 10,000 | r 15,000 | 17,000 |
| Platinum-group metals: | | | |
| Platinum-group metal content of concentrate, matte, and refinery products e thousand troy ounces | 1,450 | 2,360 | 2,832 |
| Osmiridium from gold ore e troy ounces | 3,000 | 2,800 | 2,500 |
| Silver metal, primary thousand troy ounces | 3,294 | 3,652 | 2,994 |
| Tin: | | | |
| Concentrate: | | | |
| Gross weight long tons | 3,624 | 4,976 | 5,068 |
| Metal content do | 2,125 | 2,634 | 2,436 |
| Metal, primary do | 767 | 860 | e 840 |
| Tungsten concentrate, 60% $WO_3$: | | | |
| Gross weight kilograms | 1,000 | 1,000 | -- |
| Tungsten, content do | 550 | 550 | -- |
| Uranium oxide ($U_3O_8$) | 3,629 | 3,094 | 3,074 |
| Vanadium: | | | |
| Vanadiferous slag, gross weight | r 31,519 | r 35,870 | 36,146 |
| Vanadium content of: | | | |
| Vanadiferous slag produced e | r 4,413 | 5,022 | 5,060 |
| Vanadium pentoxide and vanadate products e | r 2,905 | 3,185 | 3,092 |
| Total | 7,318 | 8,207 | 8,152 |
| Zinc: | | | |
| Concentrate: | | | |
| Gross weight | 4,017 | 34,031 | 67,993 |
| Metal content | 2,009 | 17,016 | e 34,000 |
| Smelter | 47,200 | 58,100 | 68,000 |
| Zirconium concentrate (baddeleyite) | -- | 4,956 | 11,978 |

See footnotes at end of table.

**Table 1.—Republic of South Africa: Production of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| NONMETALS | | | |
| Asbestos: | | | |
| Amosite | 102,278 | 106,477 | 94,543 |
| Chrysotile | r 58,512 | 107,807 | 82,430 |
| Crocidolite [1] | r 159,838 | 155,941 | 156,299 |
| Total | r 320,628 | 332,225 | 333,272 |
| Barite | 2,517 | 2,014 | 2,063 |
| Cement, hydraulic thousand tons | 6,108 | 6,864 | 7,296 |
| Clays: | | | |
| Bentonite | 24,312 | 25,080 | 38,803 |
| Fire clay | 306,229 | 291,503 | 332,066 |
| Flint clay | 281,671 | 261,264 | NA |
| Fuller's earth | 1,897 | 916 | e 900 |
| Kaolin | 38,218 | 38,615 | 48,840 |
| Corundum, natural | 294 | 269 | 275 |
| Diamond: | | | |
| Gem e thousand carats | 3,370 | 3,448 | 3,422 |
| Industrial e do | 4,025 | 4,117 | 4,088 |
| Total do | 7,395 | 7,565 | 7,510 |
| Diatomite | 314 | 528 | 789 |
| Feldspar | 25,322 | 31,692 | 39,540 |
| Fertilizer materials, crude, natural phosphate rock thousand tons | 1,966 | 2,063 | 7,824 |
| Fluorspar: | | | |
| Acid grade | 142,883 | 185,304 | 193,565 |
| Ceramic grade | 17,861 | 4,475 | 4,989 |
| Metallurgical grade | 50,062 | 20,545 | 9,379 |
| Total | 210,806 | 210,324 | 207,933 |
| Gem stones, semiprecious: | | | |
| Emerald crystals kilograms | 1,089 | 1,272 | 2,242 |
| Tiger's eye | 72 | 75 | 113 |
| Graphite | 847 | 1,029 | 1,554 |
| Gypsum, crude | 419,392 | 483,239 | 557,448 |
| Kyanite and related materials: | | | |
| Andalusite | 45,857 | 60,702 | 64,008 |
| Sillimanite | 9,476 | 19,317 | 13,091 |
| Lime thousand tons | 1,194 | 1,399 | • 1,184 |
| Lithium minerals (spodumene) | -- | -- | 411 |
| Magnesite, crude | 68,792 | 80,189 | 72,663 |
| Mica: | | | |
| Sheet kilograms | 1,733 | 219 | 1,000 |
| Waste | 4,245 | 6,009 | 2,870 |
| Pigments, natural mineral: | | | |
| Ochers | 1,620 | 1,738 | 1,915 |
| Oxides | 6,827 | 583 | 858 |
| Pyrite: | | | |
| Gross weight: | | | |
| Cupriferous | -- | -- | NA |
| Noncupriferous | 438,577 | 551,113 | NA |
| Total | 438,577 | 551,113 | 511,037 |
| Sulfur content: | | | |
| Cupriferous | -- | -- | NA |
| Noncupriferous | 175,400 | 220,400 | NA |
| Total | 175,400 | 220,400 | 204,414 |
| Quartz, quartzite and glass sand (silica) | 682,513 | 792,009 | 898,280 |
| Salt | 370,423 | 391,249 | 220,454 |
| Silcrete | 22,456 | 24,861 | 15,234 |
| Stone, sand and gravel n.e.s.: | | | |
| Dimension stone: | | | |
| Granite: | | | |
| Sawn slabs [2] | 23,278 | 19,407 | NA |
| Rough blocks [2] | 270,140 | 316,805 | NA |
| Marble | 3,237 | 3,147 | 10,532 |
| Crushed and broken: | | | |
| Limestone [2] thousand tons | 13,363 | 14,140 | 14,929 |
| Shale do | 572 | 358 | 532 |
| Sulfur, elemental byproduct e | 24,000 | 25,000 | 28,000 |
| Talc and related materials: | | | |
| Pyrophyllite (wonderstone) | 2,059 | 4,743 | 8,410 |
| Talc | 8,760 | 7,100 | 9,589 |
| Vermiculite | 147,903 | 156,461 | 182,613 |

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Carbon black e | | 30,000 | 30,000 | 40,000 |
| Coal: | | | | |
| Anthracite | thousand tons | 1,336 | 1,408 | e 1,435 |
| Bituminous | do | 57,104 | 60,944 | 64,621 |
| Total | do | 58,440 | 62,352 | 66,056 |
| Coke: | | | | |
| Oven and beehive | do | 3,583 | e 3,600 | e 3,952 |
| Gashouse, low and medium temperature | do | 101 | 99 | |
| Petroleum refinery products: e | | | | |
| Gasoline | thousand 42-gallon barrels | 24,589 | 24,487 | |
| Jet fuel | do | 1,002 | 2,589 | |
| Kerosine | do | 3,315 | 2,479 | |
| Distillate fuel oil | do | 20,493 | 21,301 | NA |
| Residual fuel oil | do | 21,727 | 20,427 | |
| Lubricants | do | 1,292 | 1,680 | |
| Other | do | 4,810 | 4,941 | |
| Refinery fuel and losses | do | 7,606 | 5,313 | |
| Total | do | 84,834 | 83,217 | NA |

e Estimate. p Preliminary. r Revised. NA Not available.
1 Includes asbestos reported in source as anthophyllite, Cape Blue, and Transvaal Blue.
2 Local sales plus exports (actual production not reported).

## TRADE

In 1974, the Republic of South Africa's balance of payments position was aided significantly by export sales of mineral commodities, principally those of gold, diamond, platinum, and copper. Although the volume of mineral exports did not increase appreciably, the export value of most mineral products increased dramatically over that of 1973 because of high gold prices and substantial increases in the prices of most metals and minerals owing to strong world demand. Imports of metals and mineral products also increased significantly in 1974, primarily to satisfy the demands of the country's development programs. Imports of ores, concentrates, and metals increased 57% in volume and 123% in value over those of 1973. Oil imports continued to adversely affect the trade balance, spurring the search for domestic oil and promoting the construction of another oil-from-coal conversion plant.

Table 2.—Republic of South Africa: Mineral products trade
(Million dollars)

| Products | Exports | | Imports | |
|---|---|---|---|---|
| | 1973 | 1974 | 1973 | 1974 |
| Mineral products | 307 | 425 | 57 | 144 |
| Chemicals and allied products | 125 | 171 | 374 | 660 |
| Articles of stone, etc., ceramic products, glass, and glassware | 15 | 21 | 66 | 90 |
| Precious and semiprecious stones, jewelry | 692 | 1,103 | 46 | 63 |
| Base metals and products | 524 | 717 | 354 | 748 |
| Total | r 1,663 | 2,437 | r 897 | 1,705 |

r Revised.

Source: Commerce and Industry. V. 34, No. 1, September 1975, pp. 26–29.

## Table 3.—Republic of South Africa: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Oxide and hydroxide | | 2 | NA |
| Metal including alloys: | | | |
| Scrap | | 1,648 | NA |
| Unwrought and semimanufactures | | 2,324 | NA |
| Antimony ore and concentrate | | 35,267 | 35,267 |
| Arsenic: | | | |
| Trioxide, pentoxide, acids [2] | | 2,376 | NA |
| Metal | | 3 | NA |
| Beryllium, beryl | | 532 | 149 |
| Chromium: | | | |
| Chromite | thousand tons | 871 | 949 |
| Oxide and hydroxide | | 21 | NA |
| Copper: | | | |
| Ore and concentrate | | 1,974 | NA |
| Metal including alloys: | | | |
| Scrap | | 15 | NA |
| Unwrought: | | | |
| Blister and other unrefined [2] | | 51,174 | [3]119,288 |
| Refined [2] | | 78,758 | |
| Master alloys | | 1 | NA |
| Semimanufactures | | 14,909 | [3]4,575 |
| Gold metal, unworked or partly worked [4] | troy ounces | 670 | NA |
| Iron and steel: | | | |
| Ore and concentrate [2] | | 5,120 | [5]4,958 |
| Metal: | | | |
| Scrap | | 5,442 | [5]1,000 |
| Pig iron | | 495,176 | [5]442,200 |
| Sponge iron, powder, shot | | 315 | [5]400 |
| Ferroalloys: | | | |
| Ferromanganese | | 230,106 | [5]276,300 |
| Ferrochrome | | 151,862 | [5]175,200 |
| Ferrosilicon | | 25,104 | [5]36,500 |
| Other | | 12,095 | [5]25,400 |
| Ingots and other primary forms | | 8,087 | [5]90,800 |
| Semimanufactures: | | | |
| Bars and rods | | 59,071 | [5]59,400 |
| Angles, shapes, sections | | 127,263 | [5]97,900 |
| Plate and sheet | | 281,089 | [5]241,100 |
| Hoop and strip | | 8,833 | [5]22,000 |
| Rails and accessories | | 22,167 | [5]35,900 |
| Wire | | 5,682 | [5]8,200 |
| Tubes, pipes, fittings | | 12,430 | [5]12,200 |
| Castings and forgings | | NA | [5]1,600 |
| Total | | 516,535 | [5]478,300 |
| Lead: | | | |
| Concentrate [2] | | 5,504 | 1,141 |
| Oxide | | 194 | -- |
| Metal including alloys: | | | |
| Unwrought [2] | | 40,332 | 49,200 |
| Semimanufactures | | 104 | NA |
| Magnesium metal, scrap | | 200 | NA |
| Manganese: | | | |
| Ore and concentrate | thousand tons | 2,504 | 3,593 |
| Oxides | | 476 | -- |
| Metal, electrolytic | | 11,896 | NA |
| Mercury | 76-pound flasks | 3 | NA |
| Nickel: | | | |
| Ore and concentrate | | 9,984 | NA |
| Matte, speiss, and similar materials | | 207 | NA |
| Metal including alloys: | | | |
| Scrap | | 157 | NA |
| Unwrought | | 10,193 | 14,434 |
| Semimanufactures | | 245 | NA |
| Platinum-group metals including alloys, all forms | thousand troy ounces | 481 | NA |
| Silver: | | | |
| Waste and sweepings [6] | troy ounces | 403,326 | NA |
| Metal including alloys | thousand troy ounces | 2,749 | NA |
| Tin: | | | |
| Ore and concentrate | long tons | 3,009 | 1,588 |
| Metal including alloys: | | | |
| Scrap | do | -- | NA |
| Unwrought and semimanufactures | do | 42 | NA |

See footnotes at end of table.

## Table 3.—Republic of South Africa: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel—Continued | | | |
| Dimension stone—Continued | | | |
| Crude and partly worked—Continued | | | |
| Granite | | 238,618 | 305,103 |
| Slate | | 969 | 3,116 |
| Worked, including slate | | 866 | NA |
| Dolomite, chiefly refractory grade | | 2,889 | NA |
| Gravel and crushed rock | | 389 | NA |
| Limestone, except dimension | | 12,286 | 59,912 |
| Quartz and quartzite | | 766 | 2,910 |
| Sand excluding metal bearing | | 2,283 | 3,215 |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | | 127 | NA |
| Colloidal | | 8 | NA |
| Sulfuric acid | | 6,705 | NA |
| Talc and steatite | | 360 | 6,805 |
| Vermiculite | | 128,935 | 126,604 |
| Other nonmetals, n.e.s.: | | | |
| Crude | | 10,447 | NA |
| Slag, dross and similar waste, not metal bearing: | | | |
| From iron and steel manufacture | | 60,060 | NA |
| Slag and ash, n.e.s | | 171 | NA |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | | 7,265 | NA |
| Carbon black and gas carbon | | 4,480 | NA |
| Coal and briquets: | | | |
| Anthracite | | 1,167,500 | 905,483 |
| Other | | r 323,491 | 1,039,183 |
| Coke and semicoke | | 12,629 | 1,164 |
| Gas, hydrocarbon, natural and manufactured | | 2,206 | NA |
| Petroleum refinery products: | | | |
| Gasoline | thousand 42-gallon barrels | 631 | NA |
| Kerosine and jet fuel | do | 236 | NA |
| Distillate fuel oil | do | 3,715 | NA |
| Residual fuel oil | do | 19,070 | NA |
| Lubricants, including grease | do | 452 | NA |
| Other: | do | | |
| Mineral jelly and wax | do | 107 | 301 |
| Pitch | do | 2 | |
| Bitumen and other residues | do | 68 | |
| Bituminous mixtures, n.e.s | do | 14 | |
| Total | do | 24,295 | NA |
| Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals, n.e.s | | 37 | NA |

r Revised. NA Not available.

[1] Sources: 1972—Department of Customs and Excise. Foreign Trade Statistics. V. 1, 1972, 553 pp.; 1973—Department of Mines. Quarterly Information Circular Minerals, October-December 1974. Pretoria 1975, 74 pp. It should be noted that these figures represent the combined exports of the Republic of South Africa, Botswana, Lesotho, Swaziland, and the Territory of South-West Africa.

[2] Partly or wholly from Botswana, Lesotho, Swaziland, or the Territory of South-West Africa.

[3] Source: World Bureau of Metal Statistics. World Metal Statistics, April 1976, pp. 56, 70.

[4] Industrial gold only; excludes large quantities of monetary gold not reported officially in trade [illegible].

[illegible] British Steel Corp. Statistical Services. International Steel Statistics Republic of South [illegible]don, 1974, 42 pp.

[illegible] sweepings of platinum.

[illegible] rates are reported under lead.

[illegible] In original source in units of area.

## Table 3.—Republic of South Africa: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS—Continued | | |
| Titanium oxide | 451 | NA |
| Tungsten: | | |
| Ore and concentrate | 20 | NA |
| Metal including alloys, all forms | 1 | NA |
| Vanadium, pentoxide (fused) [7] | 4,692 | NA |
| Zinc: | | |
| Ore and concentrate [2] | 16,679 | 39,442 |
| Oxide | 476 | NA |
| Metal including alloys: | | |
| Scrap, dust, powder | 1,318 | NA |
| Unwrought and semimanufactures | 159 | NA |
| Other: | | |
| Ore and concentrate: | | |
| Of base and precious metals, n.e.s | 830 | NA |
| Of molybdenum, tantalum, titanium, vanadium, zirconium | 613 | 8,143 |
| Ash and residue containing nonferrous metals | 4,998 | NA |
| Waste and sweepings of precious metals, troy ounces | 882 | NA |
| Metals including alloys: | | |
| Alkali and alkaline earths, kilograms | 800 | NA |
| Base metals, n.e.s | 342 | NA |
| NONMETALS | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | 12 | NA |
| Grinding and polishing wheels and stones | 311 | NA |
| Asbestos [2] | 295,846 | 321,291 |
| Barite | 56 | 5 |
| Boron materials, boric acid | 11 | NA |
| Cement | 59,285 | 60,000 |
| Chalk | 2,452 | NA |
| Clays and clay products: | | |
| Crude clays, n.e.s.: | | |
| Andalusite, kyanite, sillimanite | 22,837 | 32,036 |
| Other | 160,999 | 124,873 |
| Products: | | |
| Refractory | 29,696 | NA |
| Nonrefractory [8] | 618 | NA |
| Diamond: [2] | | |
| Gem, unworked and worked, thousand carats | 3,065 | NA |
| Industrial: | | |
| Natural, do | 10,049 | NA |
| Manufactured, do | 7,796 | NA |
| Diatomite | 133 | -- |
| Feldspar | 13,884 | 8,003 |
| Fertilizer materials: | | |
| Crude: | | |
| Phosphatic rock | 3,684 | 1,206 |
| Other | 2,258 | NA |
| Manufactured: | | |
| Nitrogenous | 21,146 | NA |
| Phosphatic | 28,462 | NA |
| Potassic | 719 | NA |
| Other | r 1,313 | NA |
| Ammonia | 1,390 | NA |
| Fluorspar | 125,051 | 114,536 |
| Graphite, natural | 225 | 901 |
| Gypsum and plasters | 15,760 | 22,710 |
| Lime | 11,241 | |
| Lithium minerals | 1,286 | |
| Magnesite | 1,444 | |
| Mica: | | |
| Crude, including splittings and waste | | |
| Worked, including agglomerated splittings, value, thousands | | |
| Pigments, mineral: | | |
| Natural, crude | | |
| Iron oxides, processed | | |
| Precious and semiprecious stones, except diamond | | |
| Salt | | |
| Sodium and potassium compounds, n.e.s.: | | |
| Caustic soda | | |
| Caustic potash | | |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude and p | | |
| Calc | | |

See f

## Table 4.—Republic of South Africa: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite | 13,275 | 20,589 | Australia 11,127; French Guinea 7,052. |
| Oxide and hydroxide | 103,495 | 119,846 | Australia 116,071. |
| Metal including alloys: | | | |
| Scrap | 339 | 440 | West Germany 208. |
| Unwrought | 1,136 | 878 | France 524; Norway 143; United Kingdom 108. |
| Semimanufactures | r 6,506 | 8,573 | United States 3,809; France 964; United Kingdom 770. |
| Arsenic: | | | |
| Oxides and acids | 73 | 133 | United Kingdom 110; West Germany 11. |
| Metal | -- | 3 | NA. |
| Chromium: | | | |
| Chromite | 124,465 | 122,703 | NA. |
| Oxide and hydroxide | 20 | 94 | West Germany 50; United Kingdom 25. |
| Cobalt, oxide and hydroxide | 15 | 18 | Canada 10; United Kingdom 5. |
| Copper: | | | |
| Ore and concentrate | 34,792 | 37,138 | Italy 306. |
| Metal including alloys: | | | |
| Scrap | 80 | 278 | Hong Kong 53. |
| Unwrought | 6,509 | 5,947 | United Kingdom 23. |
| Semimanufactures | 2,630 | 1,952 | United Kingdom 843; West Germany 327. |
| Gold metal, unworked or partly worked troy ounces | 7,229 | 8,256 | United Kingdom 4,883. |
| Iron and steel: | | | |
| Ore and concentrate | -- | 1 | NA. |
| Metal: | | | |
| Scrap | 50,371 | 24,846 | United Kingdom 1,517. |
| Pig iron, ferroalloys, similar materials | r 8,607 | 9,381 | Sweden 2,437; United Kingdom 1,308. |
| Steel ingots and other primary forms | 60,179 | 28,832 | NA. |
| Semimanufactures: | | | |
| Bars and rods | r 32,255 | 108,003 | Japan 28,405; West Germany 15,137; United Kingdom 11,291. |
| Angles, shapes, sections | r 12,123 | 17,228 | Belgium 7,335; Japan 3,469; United Kingdom 2,750. |
| Plate and sheet | 66,803 | 303,790 | Japan 173,244; West Germany 50,449; Belgium-Luxembourg 21,652. |
| Hoop and strip | r 6,801 | 39,783 | West Germany 28,798; Belgium-Luxembourg 5,078. |
| Rails and accessories | 23,040 | 2,463 | France 451; Japan 443; United Kingdom 288. |
| Wire and wire rod | 8,764 | 11,877 | Belgium-Luxembourg 3,114; West Germany 2,078; United Kingdom 1,697. |
| Tubes, pipes, fittings | r 28,819 | 33,347 | Japan 17,049; West Germany 4,552; United Kingdom 3,367. |
| Castings and forgings, rough | 5,108 | 4,714 | Australia 1,428; France 1,132; United Kingdom 1,008. |
| Total | r 183,713 | 521,205 | |
| Lead: | | | |
| Ore and concentrate | 11,025 | 10,420 | All from United States. |
| Oxides | 38 | 22 | NA. |
| Metal including alloys: | | | |
| Scrap | 1,928 | 2,684 | Belgium-Luxembourg 881; Australia 240. |
| Unwrought | 10,046 | 6,129 | Belgium-Luxembourg 601. |
| Semimanufactures | 52 | 119 | West Germany 32. |
| Magnesium metal including alloys, all forms | 412 | 617 | United States 571. |
| Manganese: | | | |
| Ore and concentrate | 738 | 606 | United Kingdom 556. |
| Oxides | 437 | 828 | Japan 225; United States 140; Belgium-Luxembourg 109. |
| Mercury 76-pound flasks | 1,830 | 1,711 | Spain 560; Italy 499; U.S.S.R. 200. |

See footnotes at end of table.

**Table 4.—Republic of South Africa: Imports of mineral commodities [1]—Continued**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Molybdenum metal including alloys, all forms | 29 | 5 | United States 3; United Kingdom 2. |
| Nickel metal including alloys, all forms | 698 | 566 | United Kingdom 271; West Germany 97. |
| Platinum-group metals including alloys, all forms troy ounces | 3,991 | 1,565 | United Kingdom 1,229. |
| Silicon and tellurium | 307 | 226 | France 84; Canada 80. |
| Silver: | | | |
| Waste and sweepings troy ounces | 4,138 | 54,343 | NA. |
| Metal including alloys, all forms do | 565,608 | 1,040,666 | Australia 698,583; United Kingdom 141,000. |
| Tin: | | | |
| Ore and concentrate long tons | 173 | 88 | NA. |
| Oxides do | 22 | 19 | United Kingdom 11. |
| Metal: | | | |
| Scrap do | 55 | 29 | NA. |
| Unwrought and semimanufactures do | 470 | 978 | NA. |
| Titanium (ilmenite): | | | |
| Ore and concentrate | 292 | -- | |
| Oxides | 413 | 546 | Norway 258; West Germany 159. |
| Tungsten: | | | |
| Ore and concentrate | 543 | 468 | NA. |
| Metal including alloys, all forms | 45 | 49 | Australia 10. |
| Zinc: | | | |
| Ore and concentrate | 21,599 | 16,036 | Australia 8,533; United States 7,500. |
| Oxides | 173 | 303 | West Germany 151; United Kingdom 105; France 40. |
| Metal including alloys: | | | |
| Scrap including powdered dust | 813 | 1,234 | Italy 702; United Kingdom 105. |
| Unwrought | 6,683 | 918 | Australia 281. |
| Semimanufactures | 85 | 177 | West Germany 31. |
| Zirconium, ore and concentrate | 340 | 72 | NA. |
| Other: | | | |
| Ore and concentrate of— | | | |
| Molybdenum, tantalum, vanadium | 132 | 271 | Canada 94; United States 89. |
| Other base metals, n.e.s | 1,795 | 3,152 | Australia 2,447. |
| Ash and residue containing nonferrous metals | 10,888 | 13,439 | New Zealand 1,917; Italy 1,679. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | 342 | 212 | United States 130; West Germany 23. |
| Elemental boron, phosphorus, and/or selenium | 99 | 69 | West Germany 26; United Kingdom 22. |
| Metals including alloys, all forms: | | | |
| Alkali, alkaline earth, rare-earth metals | 8 | 31 | United Kingdom 19; Austria 12. |
| Pyrophoric alloys | 6 | 8 | United Kingdom 2; Austria 2. |
| Base metals including alloys, all forms, n.e.s.[2] | 358 | 421 | United Kingdom 209. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 2,374 | 2,441 | NA. |
| Grinding and polishing wheels and stones | 451 | 605 | West Germany 179; United Kingdom 112. |
| Asbestos | 16,162 | 19,388 | NA. |
| Barite | 1,859 | 3,211 | NA. |
| Boron materials: | | | |
| Crude natural borates | 1,865 | 1,862 | United States 1,581. |
| Acid | 674 | 1,000 | France 740; United States 153. |
| Bromine | 21 | 13 | NA. |
| Cement | 60,258 | 71,991 | United Kingdom 9,592; Japan 7,327. |
| Chalk | 5,193 | 6,627 | France 5,555. |
| Clays and clay products: | | | |
| Crude clays and refractory minerals | 16,755 | 17,151 | United States 7,845; United Kingdom 6,305. |

See footnotes at end of table.

## Table 4.—Republic of South Africa: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Clays and clay products—Continued | | | |
| Products: | | | |
| Refractory | 29,546 | 42,192 | West Germany 12,515; Japan 7,314; Austria 6,055. |
| Nonrefractory | 12,658 | 5,600 | NA. |
| Cryolite and chiolite | 82 | 776 | United Kingdom 681; Denmark 95. |
| Diamond: | | | |
| Gem ---- carats | 98,500 | 63,000 | United Kingdom 55,000. |
| Industrial ---- thousand carats | 4,794 | 10,164 | United Kingdom 2,606; Ireland 809. |
| Diatomite and other infusorial earth | 3,794 | 6,747 | United States 5,695. |
| Feldspar, leucite, nepheline syenite | 210 | 184 | United States 139. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 168 | 42 | NA. |
| Phosphatic | 3 | 385 | All from Israel. |
| Potassic | 181,456 | 177,410 | West Germany 71,864; Israel 17,924. |
| Other | 1,050 | 4,552 | NA. |
| Manufactured: | | | |
| Nitrogenous | 104,758 | 31,133 | Netherlands 12,211. |
| Phosphatic: | | | |
| Thomas slag | 10,908 | 5,699 | Belgium-Luxembourg 4,835; Netherlands 864. |
| Other | 8,392 | 563 | Belgium-Luxembourg 240. |
| Potassic | 26,870 | 45,053 | West Germany 25,134. |
| Other including mixed | r 455 | 497 | Belgium-Luxembourg 445. |
| Graphite, natural e | 333 | 234 | Norway 157; West Germany 20. |
| Gypsum and plasters | 5,949 | 7,184 | West Germany 4,867; Spain 1,178; United Kingdom 1,056. |
| Lime | 395 | 532 | NA. |
| Lithium minerals, not further described | 10,110 | 437 | NA. |
| Magnesite | 98,053 | 122,256 | Italy 13,900; Japan 8,870. |
| Mica: | | | |
| Crude, including splittings and waste | 420 | 469 | NA. |
| Worked, including agglomerated splittings | 60 | 48 | United Kingdom 30; United States 6. |
| Pigments, mineral: | | | |
| Natural, crude | 695 | 811 | United Kingdom 368; Australia 355. |
| Iron oxides, processed | 2,712 | 3,279 | West Germany 2,816. |
| Precious and semiprecious stones, except diamond ---- value, thousands | $960 | $2,099 | Ireland $949. |
| Pyrite | 9 | 37 | NA. |
| Salt | 2,002 | 1,793 | United Kingdom 644; Netherlands 497. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 6,400 | 31,925 | France 15,616; United States 12,911. |
| Caustic potash | 896 | 1,531 | United States 700; West Germany 280. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous | 759 | 576 | Italy 541. |
| Slate | -- | 211 | All from Canada. |
| Other | 1,363 | 552 | NA. |
| Worked | 1,676 | 2,407 | Italy 1,733; Portugal 336. |
| Dolomite | 114 | 133 | Japan 131. |
| Gravel and crushed stone | 69,313 | 91,030 | NA. |
| Limestone | 19 | 40 | NA. |
| Quartz and quartzite | 49 | 23 | NA. |
| Sand excluding metal bearing | 2,038 | 1,570 | United States 117. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 222,178 | 206,662 | Canada 108,661. |
| Colloidal | 359 | 593 | West Germany 521. |
| Sulfur dioxide | 2 | 1 | NA. |
| Sulfuric acid | 108 | 112 | NA. |
| Talc and steatite | 2,131 | 2,985 | Republic of Korea 918; Italy 744; France 325. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 1,312 | 2,586 | Australia 1,670; Greece 450. |
| Slag, dross and similar waste, not metal bearing: | | | |
| From iron and steel manufacture | 28,875 | 38,675 | Mainly from Canada. |

See footnotes at end of table.

**Table 4.—Republic of South Africa: Imports of mineral commodities [1]—Continued**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Other nonmetals, n.e.s—Continued | | | |
| Slag, dross and similar waste, not metal bearing—Continued | | | |
| Slag and ash, n.e.s | 24 | 198 | Australia 92; United States 45. |
| Oxides and hydroxides of magnesium, strontium, and barium | 243 | 579 | United States 280; United Kingdom 141. |
| Iodine and fluorine | 5 | 12 | Japan 5; West Germany 5. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 4,281 | 1,161 | Austria 551; United Kingdom 101. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 3,802 | 4,343 | United States 1,032. |
| Carbon and carbon black | 3,575 | 4,208 | United States 2,262; Canada 525. |
| Coal, all grades, including briquets | 15,353 | 727 | NA. |
| Coke and semicoke | 1 | 650 | NA. |
| Gas, hydrocarbon, natural | 796 | 394 | NA. |
| Hydrogen and rare gases | 23 | 51 | Japan 17; United States 7. |
| Peat | 595 | 217 | NA. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 85,841 | | |
| Refinery products: | | | |
| Gasoline, motor do | 1,675 | | |
| Kerosine (including jet fuel) and white spirit do | 1,292 | NA | NA. |
| Distillate fuel oil do | 3,744 | | |
| Residual fuel oil do | 8,264 | | |
| Lubricants (including grease) do | 1,044 | | |
| Other: | | | |
| Mineral jelly and wax do | 182 | 260 | West Germany 68; United States 50; Japan 43. |
| Nonlubricating oils, n.e.s do | 6,704 | NA | NA. |
| Bitumen and other residues 42-gallon barrels | r 15,968 | 21,428 | Netherlands 12,217. |
| Bituminous mixtures, n.e.s do | 4,733 | 5,963 | United States 4,394. |
| Pitch do | 2,221 | 8,498 | West Germany 6,600. |
| Petroleum coke do | 38,815 | 66,099 | United States 51,299; United Kingdom 13,761. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 49,170 | 95,870 | NA. |

r Revised. NA Not available.
[1] Source: Republic of South Africa, Department of Customs and Excise. Foreign Trade Statistics, V. I, 1973; includes Botswana, Lesotho, Swaziland, and the Territory of South-West Africa.
[2] Includes some manufactures, not separable from unwrought and semimanufactures in source.

## Table 5.—Republic of South Africa: Major domestic mineral sales [1]

(Thousand dollars)

| Commodity | 1973 | 1974 |
|---|---|---|
| METALS | | |
| Chromite | 4,967 | 7,089 |
| Copper | 92,210 | 126,167 |
| Iron ore | 20,562 | 22,769 |
| Manganese ore | 9,446 | 16,427 |
| Nickel | 13,559 | 19,041 |
| Tin | 3,960 | 7,030 |
| Zinc concentrate | 2,029 | 5,309 |
| NONMETALS | | |
| Andalusite and sillimanite | 1,105 | 1,457 |
| Asbestos | 3,355 | 4,026 |
| Clays | 4,024 | 4,739 |
| Feldspar | 856 | 1,158 |
| Fluorspar | 828 | 868 |
| Gypsum | 1,866 | 2,366 |
| Limestone | 19,232 | 24,854 |
| Lime products, burnt | 16,756 | 17,010 |
| Magnesite | 1,020 | 1,454 |
| Phosphate rock | 20,670 | 24,402 |
| Pyrite (for sulfur) | 5,616 | 5,643 |
| Salt | 6,268 | 6,842 |
| Silica [2] | 4,754 | 6,372 |
| Slate | 1,845 | 2,191 |
| Stone, dimension | 1,054 | 1,051 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Coal | 199,640 | 262,334 |
| MISCELLANEOUS | | |
| Other minerals | 83,218 | 92,217 |
| Total | 518,840 | 662,816 |

[1] Does not include gold, silver, and diamond.
[2] Includes silcrete.

Source: Republic of South Africa, Department of Mines. Quarterly Information Circular. October–December 1974, pp. 29–30.

Table 6.—Republic of South Africa: Major mineral exports in 1974
(Thousand dollars)

| Commodity | 1973 | 1974 |
|---|---|---|
| METALS | | |
| Antimony, concentrate | 17,985 | 28,417 |
| Chromite | 19,513 | 21,890 |
| Copper | 155,140 | 202,243 |
| Gold [1] | 2,585,524 | 3,853,745 |
| Iron ore | 30,489 | 28,908 |
| Manganese ore | 67,125 | 98,707 |
| Nickel | 30,769 | 50,682 |
| Silver [1] | 10,594 | 12,073 |
| Tin, concentrate | 6,537 | 10,481 |
| Vanadium [2] | 33,139 | 39,532 |
| Zinc | 2,197 | 6,806 |
| Zirconium, concentrate | 2,801 | 2,110 |
| NONMETALS | | |
| Andalusite and sillimanite | 2,070 | 2,740 |
| Asbestos | 64,506 | 75,720 |
| Clays | 4,065 | 6,170 |
| Diamond [1] | 234,620 | 210,444 |
| Feldspar | 314 | 169 |
| Fluorspar | 5,937 | 6,816 |
| Gem stones, semiprecious | 507 | 759 |
| Limestone | 869 | 884 |
| Mica | 650 | 582 |
| Phosphate, ore and concentrate | 56 | 1,010 |
| Stone, dimension | 14,971 | 15,540 |
| Vermiculite | 4,946 | 5,593 |
| Wonderstone (pyrophyllite) | 925 | 754 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Coal | 20,153 | 31,837 |
| MISCELLANEOUS | | |
| Other minerals [3] | 275,032 | 401,490 |
| Total | 3,591,434 | 5,116,102 |

[1] Total value, including domestic sales, if any.
[2] Includes slag, poly and metavanadate, fused pentoxide, ferrovanadium, and Carvan, in $V_2O_5$ content.
[3] Mainly platinum and uranium.

Source: Republic of South Africa, Department of Mines. Quarterly Information Circular. October–December 1974.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Alusaf (Pty.) Ltd., the country's only producer of primary aluminum metal, completed a $26 million expansion program in mid-1974 to increase aluminum output capacity 40% to 78,000 tons per year. The new capacity exceeds the country's requirements and plans called for the export of about 20,000 tons of aluminum in 1975. Production was a record 75,000 tons in 1974, 42% higher than in 1973. All of the smelter's alumina was imported, principally from the Gove, Australia, operation of Alusuisse (Swiss Aluminium Ltd.) which has a 22% interest in Alusaf.

**Antimony.**—The Republic's only antimony producer, Consolidated Murchison Ltd. (CM), operated near capacity in 1974. CM sold all of its concentrate production, 25,212 tons, as well as 426 tons from stocks. Although the costs of production increased 29%, the value of reported concentrate sales, 22,652 tons, increased 55% on 24% less volume than reported in 1973. CM continued development of the Alpha and Beta shafts to exploit deeper extensions of known ore bodies. The Athens shaft, which was designed to hoist 50,000 tons of antimony ore monthly, was scheduled for completion in the second quarter of 1975. Sinking of the Beta shaft was suspended at 357 meters but was to be continued in 1975 following completion of surface facilities. Efforts by the company to increase antimony ore reserves were disappointing in 1974. At current output levels, proved reserves, 5.7 million tons of ore averaging 3% antimony, were sufficient for 9 years of operation.

Antimony Products (Pty.) Ltd., a joint

venture of Chemtron Corp., CM, and Johannesburg Consolidated Investment Co., Ltd. (JCI), brought its $2.2 million crude antimony oxide plant near Gravelotte, Transvaal, onstream in April. The plant, which has an annual capacity of 3,600 tons of crude antimony oxide, was anticipated to consume approximately 25% of the antimony production of CM. Initially, Chemtron will purchase the facility's full output.[4]

**Chrome and Chromite.**—Production of chromite ore and concentrate was almost 1.9 million tons, a 14% increase over that of 1973. Local mining firms, anticipating strong demand in 1974, overproduced, and yearend stocks of exportable concentrate and ore exceeded 1 million tons. The domestic market was steady, but exports declined. Chromite exports were also hampered by internal rail tieups and port loading delays at Lourenço Marques, Mozambique.

The output of chrome sand increased dramatically to meet foundry demand, and both foreign and domestic sales were significantly higher than in 1973. The production of less-than-44% $Cr_2O_3$ chromite ore continued to increase relative to higher grade material, owing to increasing acceptance of lower grade charge chrome by the stainless steel industry.

**Copper.**—In 1974, mine copper production was a record 179,111 tons, making the Republic of South Africa the twelfth largest world producer. Although copper sales volume decreased slightly in 1974, the value, which was 30% higher than in 1973, was a record $328 million, owing mainly to high copper prices in the first half of the year. The copper industry was continuing expansion programs to increase mine production and smelter output, although construction of a new electrolytic copper refinery in Cape Province was deferred because of deteriorating world economic conditions in the latter half of 1974. In northern Cape Province, Phelps Dodge Corp. was developing a large new copper mine.

PMC, the country's largest copper producer, produced slightly less copper, 90,364 tons, than in 1973 because the head grade was lower. Smelter production, however, rose 3% owing to increased toll refining. Although the cost per ton of copper produced increased 32% in 1974, PMC continued to be one of the lowest cost producers of copper in the world. Production statistics for Palabora's copper operation were as follows:

| | | 1973 | 1974 |
|---|---|---|---|
| Ore treated | million metric tons | 19.2 | 19.2 |
| Grade of ore | percent Cu | .56 | .56 |
| Concentrate produced | thousand metric tons | 249.8 | 259.9 |
| Concentrate grade | percent Cu | 37.29 | 35.19 |
| Anode production: | | | |
| PMC material | metric tons | 93,637 | 90,364 |
| Other | do | 15,134 | 21,781 |
| Total | | 108,771 | 112,145 |
| Average cost per ton of copper produced | | $554 | $731 |

In September, PMC announced a $100 million expansion program to increase copper production to 125,000 tons per year by 1977. The expansion will also increase output of byproducts such as uranium, zirconium, and nickel sulfate. Plans called for enlarging the open pit beyond previously planned limits and expanding ore processing facilities. The open pit was to be deepened an additional 128 meters to an ultimate depth of 591 meters. Mining rates were to increase to 205,000 tons per day by late 1975 and to reach 300,000 tons by 1977. The supply of ore to the concentrator will be increased by 21,500 tons to 74,000 tons per day at a reduced cutoff grade of 0.2% copper and an overall average grade of 0.55% in the mill feed. Despite the higher mining rate, the life of the open pit operation was expected to continue to 1992, the same as projected before the expansion.

Prieska Copper Mines (Pty.) Ltd. (PCM) continued to expand operations and production in fiscal 1974. Startup problems, which hampered production in fiscal 1973, were largely overcome by

[4] Chemistry and Industry. South Africa Antimony Oxide Plant Goes On-Stream. No. 18, Sept. 21, 1974, p. 709.

mid-1974. For the fiscal year the ore milled reached 2 million tons, yielding 68,491 tons of copper concentrate and 67,993 tons of zinc concentrate. Pyrite and lead concentrates were also produced.

O'okiep Copper Co., Ltd., had higher sales and net income in 1974, despite sharp increases in costs for labor and supplies. Rapidly decreasing copper prices in the second half of the year, however, forced the company to cut its workforce by almost 20%. Development work at the Spektakel and Divide mines was suspended, and production from lower grade mines was curtailed. Drilling in existing mine areas added to ore reserves, especially at depth at the Carolusburg mine. Overall ore reserves at the company's mines at yearend were 29.1 million tons averaging 1.65% copper, compared with 26.9 million tons averaging 1.58% copper in 1973.

Production statistics for O'okiep, operator of 12 mines, 3 mills, and 1 smelter in northern Cape Province, were as follows:

| | | 1973 | 1974 |
|---|---|---|---|
| Ore milled | thousand metric tons | 2,991 | 2,912 |
| Grade of ore | percent Cu | 1.34 | 1.28 |
| Blister copper produced | metric tons | 34,292 | 32,477 |
| Blister copper sales | do | 34,473 | 33,384 |
| Sales value | million dollars | 57.9 | 67.4 |

Copper production at the Messina mine of Messina (Transvaal) Development Co., Ltd., for the year ending September 30, was 10,230 tons contained in concentrate. Although the concentrator throughput increased by 48,000 tons, 590 tons less copper was produced in 1973 because of a decrease in the grade of ore milled and lower mill recoveries. At the end of the fiscal year, proved ore reserves, at 5.2 million tons, were down about 200,000 tons with an unchanged grade of 1.45% copper.

Phelps Dodge Corp. carried out extensive pilot plant testing of bulk ore samples from its two large copper-lead-zinc-silver deposits near Aggeneys in northern Cape Province. The test results indicated that the ores presented no serious mill or concentration problems. The open pit ore reserves at the Broken Hill deposit were estimated at 79 million tons grading 0.38% copper, 4.28% lead, 2.32% zinc, and 1.7 ounces of silver per ton. The ore reserves at the other deposit, Black Mountain, were 78 million tons grading about 0.7% copper, 2.6% lead, 0.6% zinc, and 0.8 ounce of silver per ton. The ultimate extensions of the two deposits were not determined. Exploration and development were continuing; however, a decision to bring the deposits into production was deferred until economic conditions improve.

O'okiep and Tsumeb Corp., Ltd., of the Territory of South-West Africa began engineering work on a new electrolytic copper refinery planned for the Cape Town area; however, at midyear the project was postponed pending improvement in economic conditions. The proposed refinery, which has a planned capacity of 120,000 tons of cathode copper, will treat all of O'okiep and Tsumeb's blister copper production.

**Gold.**—The South African gold mining industry recorded record profits in 1974, although production continued to decline. Soaring gold prices, due mainly to instability of world currencies, rampant inflation, and speculative buying prior to legalization of gold ownership by U.S. citizens, resulted in a 46% increase in the value of gold produced. Revenue received amounted to $3,854 million in 1974, compared with $2,585 million in 1973.

Total South African production of gold was 24.4 million troy ounces, 3.1 million troy ounces less than that produced in 1973. Although the industry experienced shortages of labor, aggravated by the Malawian Government's decision to ban recruitment of mine labor and by tribal violence at a number of mines, the tonnage of ore milled was only marginally lower. The grade of ore, however, fell 11% to 0.32 troy ounce of gold per ton, owing principally to the mining of marginal-grade ore made economic by high gold prices. Higher gold prices also resulted in increased ore reserves, extended the lives of existing mines, and accelerated exploration and development of new gold deposits.

Working costs per ton of ore milled in-

creased 26% (in terms of rands) to $19.39 in 1974, because of substantial wage and salary increases and higher costs for stores and services. Despite the higher milling costs, the working profit per ton of ore milled increased $12.27 to $31.66. Producers received an average price of $158 per troy ounce of gold in 1974, 68% more than in 1973.

The South African Chamber of Mines announced a $220 million research and development program designed to hasten mechanization in gold mining. Principal motivation for this expanded effort was the increasing cost of labor and labor uncertainties. Major emphasis has been placed on the development of rock-cutting, reef-boring, and swing-hammer machines to reduce the number of workers, increase productivity, and improve safety by reducing the amount of explosives needed.[5]

[5] Coal, Gold, and Base Metals. Rockbreaking Without Explosives. V. 22, No. 7, September 1974, pp. 27–35.

**Table 7.—Republic of South Africa: Gold output, by producer, in 1974**
(Troy ounces)

| Company or mine | Production |
|---|---|
| Barberton | 43,821 |
| Blyvooruitzicht | 943,511 |
| Bracken | 271,313 |
| Buffelsfontein | 1,017,711 |
| City Deep, Consolidated Main Reef, Crown Mines | 156,455 |
| Doornfontein | 548,540 |
| Durban Deep | 263,819 |
| East Daggafontein | 76,564 |
| East Driefontein | 609,732 |
| East Rand Proprietary Mine Ltd | 430,186 |
| Elsburg [1] | 163,004 |
| Freddies Consolidated | 299,317 |
| Free State Geduld | 1,249,527 |
| Free State Saaiplass | 166,814 |
| Grootvlei | 174,151 |
| Harmony | 986,287 |
| Hartebeestfontein | 1,079,103 |
| Kinross | 359,217 |
| Kloof | 681,267 |
| Leslie | 238,275 |
| Libanon | 458,983 |
| Loraine | 308,968 |
| Marievale | 152,774 |
| President Brand | 1,316,693 |
| President Steyn | 994,395 |
| Randfontein | 180,738 |
| St. Helena | 834,754 |
| South African Land and Exploration Co. Ltd | 178,816 |
| Stilfontein | 508,322 |
| Vaals Reefs | 2,084,449 |
| Venterspost | 300,059 |
| Vlakfontein | 126,134 |
| Welkom | 458,858 |
| West Driefontein | 2,277,594 |
| Western Areas [1] | 632,983 |
| Western Deep Levels | 1,547,027 |
| Western Holdings | 1,268,879 |
| West Rand Consolidated | 239,063 |
| Winkelhaak | 491,931 |
| Witwatersrand Nigel Ltd | 39,002 |
| Miscellaneous | 227,354 |
| Total | 24,386,390 |

[1] Effective July 1, 1974, Elsburg gold mine merged with Western Areas gold mine.

Source: Chamber of Mines of South Africa. January-December 1974.

**Table 8.—Republic of South Africa: Salient statistics of gold and uranium production by members of the Chamber of Mines, Transvaal and Orange Free State**

| | 1973 | 1974 |
|---|---|---|
| Number of operating gold mines | 41 | 42 |
| Ore milled thousand tons | 75,154 | 74,884 |
| Production of gold: | | |
| Gross weight thousand troy ounces | 27,142 | 24,159 |
| Per ton of ore milled troy ounces | .361 | .322 |
| Number of uranium-producing mines | 8 | 8 |
| Ore treated for uranium recovery thousand tons | 12,828 | 14,285 |
| Production of uranium oxide ($U_3O_8$): | | |
| Gross weight thousand pounds | 6,821 | 6,778 |
| Per ton of ore milled pounds | .53 | .46 |
| Average realized gold price, per ounce dollars | 94.14 | 158.04 |
| Working profit, gold and uranium thousand dollars | 1,484,766 | 2,314,954 |
| Taxes and lease fees payable to government do | 722,211 | 1,195,194 |
| Net dividends do | 453,434 | 832,336 |
| Average number of employees in service: | | |
| Whites | 37,017 | 36,898 |
| Nonwhites | 385,557 | 359,186 |
| Mine development, including shaft sinking meters | 899,438 | e 900,000 |
| Ore reserves, payable thousand tons | 182,365 | 287,707 |
| Average grade of reserves e troy ounces per ton | .465 | .364 |

e Estimate.

Source: Chamber of Mines of South Africa.

Three new major gold mines were under development. Unisel Gold Mines Ltd., a joint venture of Union Corp. Ltd. and Selection Trust Ltd., planned to begin production from its lease area just south of the President Brand mine in 1977. Cost of the project was estimated at $75 million. Unisel entered into an agreement under which St. Helena Gold Mines Ltd. will develop and operate the new mine. St. Helena planned to expand its mill to handle the Unisel ore.[6] In March, Anglo-American Corp. of South Africa, Ltd. (AAC) and Gold Fields of South Africa, Ltd. (GFSA) almost simultaneously announced plans to open adjacent mines, known as the Elandsrand and Deelkraal, respectively, southwest of the Western Deep Levels Ltd. mine in the Far West Rand area. Construction of surface facilities was underway by yearend at both properties. Shaft sinking was scheduled for 1975 with full-scale mining by 1980–81. Costs of the projects were estimated at $150 million each.

Loraine Gold Mines Ltd., a subsidiary of Anglo-Transvaal Consolidated Investment Co., Ltd. (Anglovaal), planned a $40 million expansion program. The program included doubling the milling rate to 200,000 tons per month by early 1979, constructing a new crushing plant, enlarging plant treatment facilities, and sinking a new shaft.

AAC planned to sink a new shaft at a cost of $120 million at the Free State Saaiplaas mine to exploit 28 million tons of marginal-grade ore. The shaft, which is designed to hoist 188,000 tons per month, was scheduled for commissioning in 1979 and was to be fully operational in 1981.

**Iron and Steel.**—Demand for steel was strong in 1974 and all categories of manufactured semifinished and finished iron and steel products registered gains. Steel production facilities were being expanded, and proposals to construct two new ferrochrome plants were made. Iron ore production increased, local sales were up, but exports declined.

ISCOR's Sishen-Saldanha Bay iron ore export project continued on schedule, but costs continued to rise. The first phase of the project, which included development of a new mine at Sishen, construction of an 860-kilometer electrified railroad, and building of port facilities to load 100,000-ton carriers at Saldanha Bay, was expected to be completed in 1976. A second, larger jetty to accommodate 260,000-ton vessels was to be added later. Iron ore exports were expected to begin in 1976, reaching 15 million tons in the early 1980's. As originally proposed, the Sishen-Saldanha

[6] South African Mining and Engineering Journal. Unisel—A Challenge to Mining Engineering. V. 87, No. 4096, September 1974, pp. 16–19.

railway line was to be used exclusively by ISCOR. However, late in the year, the Government agreed to allow private mining operations to use the railroad, which is to have a carrying capacity of 40 million to 50 million tons per year. The Government also approved, in principle, the development of the St. Croix offshore ore berth at Port Elizabeth to serve independent iron and manganese ore producers.[7]

*Iron Ore and Concentrate.*—Total iron ore production (hematite and magnetite) increased 5.4% to 11.6 million tons in 1974. Hematite production, almost 8.7 million tons, increased about 9%, whereas magnetite production, 2.9 million tons, decreased 3%. ISCOR was the principal producer of hematite, shipping 6.3 million tons of ore in 1974, up 0.3 million tons over that of 1973. The major portion of ISCOR's production, 5.8 million tons, was delivered to the company's three steelworks for processing; the rest was largely exported. ISCOR's production came from the Sishen (4.0 million tons) and Thabazimbi (2.3 million tons) mines. Iron ore production at the Sishen mine was scheduled to be gradually increased to 9.6 million tons by 1980 to meet the company's needs for raw materials. Consolidated African Mines Ltd. (CAM) and Associated Manganese Mines of South Africa Ltd. (AMM) were the other major hematite producers. The iron ore production of CAM was largely exported, whereas that of AMM (810,000 tons) was consumed internally in the production of ferroalloys.

Magnetite was produced by PCM and by Highveld Steel and Vanadium Corp. Ltd. (HSV) in 1974. PCM produced an estimated 2.2 million tons of concentrate in 1974, of which 773,198 tons was exported to Japan and about 700,000 tons was sold locally. PCM's magnetite exports declined about 6% in 1974, reportedly because of port problems at Lourenço Marques. HSV continued expansion of the Mopochs mine. The new primary crushing circuit was expected to be commissioned in 1975.

The outlook for iron ore exports from South Africa received a significant boost in 1974 with separate announcements by CAM and ISCOR relative to pending long-term contracts with Japanese buyers. In February, CAM signed a $147 million contract to supply 300,000 tons of manganiferous iron ore (34% Fe and 20% Mn) in 1977, 500,000 tons in 1978, 800,000 tons in 1979, and 1.0 million tons per year for 7 consecutive years beginning in 1980. Additionally, CAM reported that a second, larger contract for about 42 million tons was being negotiated but was contingent on the development of the St. Croix offshore ore loading terminal.

ISCOR moved ahead with its plans to export 7 million tons of iron ore per year to Japan via the newly developing Sishen-Saldanha Bay Project. In August, waste stripping operations began at ISCOR's new mine at Sishen, which is to provide the ore for the export scheme. Ore from the new mine, which is expected to begin production in 1975, was planned to be exported initially from St. Elizabeth until the railroad and port facilities are completed at Saldanha Bay in 1976.

*Iron and Steel Semimanufactures.*—Demand for steel continued strong in 1974, reflecting the massive requirements of South Africa's ambitious large-scale development projects. Despite increased local production of steel, many products were in short supply and imports rose significantly. Shortages in supply of most steel products, as well as the quantity of imports, were expected to gradually decrease as new production facilities in ongoing expansion projects come onstream.

ISCOR's long-term expansion, modernization, and diversification program at its three works is scheduled to be completed by 1984, at which time the company's total capacity should be 11.3 million tons per year of liquid steel. In 1984, the Vanderbijlpark. Newcastle, and Pretoria works were scheduled to have capacities of 5.5 million, 4.1 million, and 1.7 million tons, per year, respectively. Cost of the program, which began in July 1973, was estimated at $4.8 billion.

ISCOR's partially completed Newcastle works poured its first liquid steel in March and produced an estimated 340,000 tons of steel for the year. The first phase of construction at the Newcastle works, which cost about $1.1 billion, was expected to be completed in 1976. The yearly steel production was expected to reach 2.2 million tons at that time and 3 million tons in 1977–78.

[7] South African Shipping News and Fishing Industry Review. In Principle Green Light for St. Croix. V. 24, No. 10, October 1974, p. 17.

ISCOR and Vereinigte Österreichische Eisen and Stahlwerke A.G. (VÖEST) deferred a decision to go ahead with plans to build a steel mill at Saldanha Bay, mainly because of severe cost escalations. Negotiations were continuing and additional partners were being sought to participate in the project. As proposed, a 3-million-ton-per-year steel plant to produce blooms, billets, and slabs exclusively for the export market was to be constructed at Saldanha Bay at a cost estimated at $1 billion. Later, as markets increased, the capacity of the plant was to be raised to 12 million tons per year.

According to ISCOR's annual report for the year ending June 30, 1974, total production of ingot steel was 4,036,513 tons, slightly less than in 1973. Of this total, the Vanderbijlpark, Pretoria, and Newcastle works contributed 2,677,630, 1,351,925, and 6,958 tons, respectively. In addition, the latter works produced 20,189 tons of continuously cast blooms direct from molten steel.

HSV continued its $20 million expansion program to increase output of steel and slag vanadium by 25%. The project was expected to be completed by mid-1975 with the commissioning of the fourth continuous casting machine. In November, HSV announced a second expansion program to provide for the manufacture of flat products and increase steel output to 750,000 tons per year; this is about 320,000 tons more than in fiscal 1974. The program was scheduled to be completed by 1979 at a cost of $97 million and includes erection of a Tipping plate mill and installation of a continuous slab casting machine, a third shaking ladle replacement, a third basic oxygen furnace (BOF) steelmaking vessel, and a sixth submerged arc furnace.

*Ferroalloys.*—In 1974, two new ferrochrome plants, each capable of producing 120,000 tons were proposed. Tubatse Ferrochrome Ltd., a joint venture of General Mining and Finance Corp. Ltd. (51%) and Union Carbide Corp. (49%), planned to build a plant at Steelport in the eastern Transvaal, and nearby at Lydenburg, JCI and Showa Denko K.K. of Japan planned to build a similar-size facility. Both plants were expected to be completed in 1977 at a cost of about $37 million each. All production was destined for the export market.

**Manganese.**—Production of metallurgical and chemical manganese increased about 14%, reaching 4.7 million tons in 1974. Combined domestic and foreign sales, both of which increased in 1974, were valued at $115 million, 50% more than in 1973. Sales reportedly could have been higher, but shipments were affected by constraints on railway and loading facilities.

South African Manganese Ltd. continues as the principal producer of manganese ore, having a record output of about 2.7 million tons. AMM, the country's other major producer, shipped more than 1.9 million tons, about 19% more than in 1973.

Delta Manganese (Pty) Ltd., (DM), a joint venture of Delta Metal Co. Ltd. and Alcan Aluminium Ltd. (Alcan), completed construction of its new $21 million electrolytic manganese plant at Nelspruit in eastern Transvaal early in 1974 and immediately began an expansion program to increase the capacity of existing facilities from 14,500 tons to about 30,000 tons per year by the yearend 1975.

**Nickel.**—Nickel production, a byproduct of platinum mining, increased about 14% to 22,100 tons in 1974. The volume and value of local sales increased 31% and 38%, respectively, and exports jumped by 40% to 14,434 tons in volume and 62% ($50.7 million) in value over those of 1973.

**Platinum.**—The Republic of South Africa was the world's leading producer of platinum-group metals, accounting for nearly two-thirds of all platinum and one-fourth of the palladium mined. Although platinum-group metal production statistics are not reported, output was estimated at 2.8 million troy ounces, including 1.8 million troy ounces of platinum. Sales of platinum and palladium were firm for most of the year but weakened in the last quarter, owing mainly to declining sales of automobiles in the United States, Europe, and Japan.

Rustenburg Platinum Mines Ltd. (RPM) continued its expansion program to increase platinum output capacity by 0.5 million ounces to about 1.63 million ounces. Late in the year, the company decided to stretch out the program by 18 months, setting a new completion date near the end of 1977. RPM purchased Eland Platinum Mining Co. Ltd. for $23 million in July, thus acquiring leases that established its Amandelbult lease as a compact mining area with a strike length of 20 kilometers.

Impala Platinum Ltd. completed the major part of an expansion program in 1974,

At yearend, the mine and refinery capacity was 950,000 ounces per year of platinum-group metals.

Major extensions of the Wadeville platinum-group refinery, owned jointly by RPM and Johnson Matthey & Co., were completed in 1974. Production capacities at the enlarged facility, the largest of its kind, were estimated at more than 1.5 million ounces of platinum-group metals.[8]

Lonrho Ltd. formally opened its $3 million platinum refinery at Brakpan in July. The refinery, which is South Africa's third and most modern platinum refinery, will toll-refine precious metal concentrate produced in Norway from matte produced at Western Platinum Ltd.'s operation near Brits.[9]

**Tin.**—Production of tin concentrate for 1974 was 5,068 long tons, an increase of about 2% over that of 1973. Rooiberg Minerals Development Co. (RMD), the major producer, reported a production of 1,976 tons of tin-in-concentrate, or about 4,000 tons of tin concentrate, for the fiscal year ending June 30, 1974. Although the ore grade at both the "A" and the "C" mines was lower in 1974, tin output increased due to the treatment of greater tonnages of slime reclaimed from the dump and to improved efficiencies. Working cost, however, continued to rise, amounting to $11.25 per ton mined compared with $10.17 per ton in fiscal 1973.

RMD planned to develop a new mine at Vellefontein by mid-1977 at a cost of $1.8 million. Ore reserves were conservatively estimated at 600,000 tons grading 0.7% tin. Plans called for the sinking of an inclined shaft to exploit the ore body and for the processing of 5,000 tons of ore monthly at the "A" mine plant.[10]

Union Tin Mines Ltd. recorded increases in the tin output in both gravity and flotation concentrates. Tin production was 377 long tons in fiscal 1974 compared with 248 long tons in fiscal 1973. The increased production of tin concentrate was due to the opening of the western section of the mine and to a higher rate of reclamation from the old tailings dumps. Exploration efforts in 1974 near the mine failed to show any significant new tin mineralization.

**Titanium.**—Quebec Iron and Titanium Corp. Ltd., Union Corp., and the Government's Industrial Development Corp. planned to establish a mining operation to produce ilmenite, rutile, and zircon from coastal sands about 15 miles north of Richards Bay. Plans also included the building of a plant to smelt the ilmenite to make pig iron and Sorel slag. Production was expected in late 1977. Reserves were estimated at 41 million tons of ilmenite, 1.5 million tons of rutile, and 3.4 million tons of zircon.

S. A. Titan Products Ltd. of Umbagintwini, 10 miles south of Durban, the only local producer of titanium oxides, planned to spend $6 million over the next 4 years to expand its production capacity. The company produced about 24,000 tons of titanium oxides in 1974 using raw materials imported from Canada.

**Uranium.**—The production of uranium, a byproduct or coproduct at eight gold mines, declined again in 1974 despite a 14% increase in gold ore treated. The decreased output reflected the policy of mining lower grade ores because of higher gold prices. Uranium production was 3,074 tons, 20 tons less than in 1973. The uranium market was generally depressed in 1974, though prices and demand were improving at yearend. About midyear, sales of uranium were reportedly temporarily halted pending an expected increase in world prices. The South African Nuclear Fuels Corp. (NUFCOR), the state-owned company through which all the country's uranium is sold, also planned to hold its uranium stocks, estimated at 20,000 tons, until prices rose.[11] Mines not processing gold ores for uranium continued to stockpile high-grade uranium-bearing slimes. The uranium mill at AAC's President Brand mine continued on a care and maintenance basis. In December, West Rand Consolidated Mines, Ltd. ceased uranium production pending better market conditions.

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[8] Platinum Metals Review. New Plants in Three Counties. V. 18, No. 3, July 1974, p. 103.

[9] Coal, Gold, and Base Metals. Platinum Is Very Much in the Picture. V. 22, No. 6, August 1974, pp. 34, 35, 37.

[10] Coal, Gold, and Base Metals. New Tin Mine for Vellefontein. V. 22, No. 8, October 1974, p. 67.

[11] U.S. Embassy, Johannesburg, Republic of South Africa. Periodic Economic Review, July and August 1974. State Department Airgram A-187, Sept. 23, 1974, p. 5.

Table 9.—Republic of South Africa: Uranium production, by company, in 1974

| Gold-uranium producer | Gold ore treated (thousand metric tons) | Production $U_3O_8$ (pounds) | Grade (pounds per ton) |
|---|---|---|---|
| Blyvooruitzich | 709 | 391,044 | 0.551 |
| Buffelsfontein | 3,093 | 1,609,858 | .520 |
| Harmony | 3,017 | 927,274 | .306 |
| Hartebeestfontein | 2,761 | 899,062 | .326 |
| Vaals Reefs | 3,317 | 1,954,279 | .588 |
| West Driefontein | 772 | 407,868 | .529 |
| Western Deep Levels | 616 | 300,375 | .487 |
| West Rand Consolidated | 369 | 288,164 | .780 |
| Total and average | 14,654 | 6,777,924 | .463 |

Source: Chamber of Mines of South Africa. January-December 1974.

The enrichment pilot plant of the government-owned Uranium Enrichment Corp. of South Africa Ltd. (UEC) at Valindaba, near Pretoria, was nearing completion and was expected to be in operation in early 1975. UEC decided late in the year to proceed with construction of a large-scale commercial enrichment plant having a yearly capacity of 2.4 million separative work units (2,400 tons of enriched uranium.) [12]

In September, plans were announced for a two-unit nuclear reactor installation, each unit of about 1,000-megawatt capacity, at Koeberg near Cape Town. A nuclear program was proposed to preserve coal resources for the petrochemical industry and for coal gasification and liquefaction.

**Vanadium.**—The vanadium market remained firm throughout the year, paralleling the world steel industry which operated at capacity in 1974. The Republic of South Africa's production of vanadium, about 40% of the world's total output, was 8,152 tons, down slightly from 1973's record high. HSV, the country's only producer of vanadium slag, increased slag output to record levels in 1974. An $18 million program to increase iron and steel and vanadium slag production by 25% was completed in December. In November, an additional $97 million expansion program was authorized to increase iron and steel production. (See iron and steel section.) Included in the program was a third shaking ladle for the production of the vanadium slag that will result from the added iron and steel output.[13] A new magnetic separation plant was commissioned late in 1974 at the Mopochs mine, which supplies ore for the steelworks (slag) and for the Vantra division (vanadium pentoxide). The new facility increased the yield of usable vanadium-bearing magnetite ore from 65% to 85%. HSV's vanadiferrous magnetite ore reserves were estimated at 120 million tons averaging between 1% and 1.6% $V_2O_5$.

Transvaal Alloys Ltd., a joint venture of the Otavi Mining Co. Ltd. and Vereinigte Aluminium-Werke A.G. of West Germany, became South Africa's third producer of vanadium pentoxide in July.[14] The company's mine and plant are located at Wapadskloof, 65 miles northeast of Middleburg. The capacity of the plant was estimated at 1,500 tons per year of vanadium pentoxide, all for the export market.

**Zinc.**—South Africa's only zinc producer, PCM completed its second year of operation, attaining full production capacity of 220,000 tons of milled ore (about 8,000 tons of zinc concentrate) monthly at midyear. PCM's production of zinc concentrate for 1974 was 67,993 tons, compared with 34,031 tons in 1973. PCM's zinc sales for domestic consumption, 28,733 tons, were made to the Zinc Corp. of South Africa (ZINCOR), an electrolytic refining company. ZINCOR's production capacity, currently 50,000 tons per year, was to be increased to 75,000 tons by 1978 to process additional PCM concentrate.

Newmont Mining Corp. and O'okiep Copper Co. planned to conduct large-scale metallurgical test work on ore from their large zinc deposit near Gamsberg in northern Cape Province. Proven ore reserves were 93,500,000 tons of 7.5% zinc and 0.55% lead. Drilling in 1974 indicated a

[12] American Metal Market. Uranium Need To Exceed Capacity. V. 81, No. 138, July 17, 1974, p. 8.

[13] Coal, Gold, and Base Metals. R-66—Million Expansion for Highveld steel. V. 22, No. 9, November 1974, pp. 39, 41.

[14] Metal Bulletin (London). Otavi V Onstream. No. 5913, Aug. 6, 1974, p. 21.

much larger potential of somewhat lower grade ore.

**Zirconium.**—PCM modified and enlarged its baddeleyite ore upgrading plant, doubling the plant's rated capacity. Production for the year was 11,978 tons, compared with 4,956 tons in 1973. A large-scale pilot plant for the production of chemical-grade zirconium sulfate was commissioned in 1974. Customer acceptance of this new product reportedly was good.

## NONMETALS

**Asbestos.**—Although the production of asbestos minerals increased marginally in 1974, total sales reached $80 million, $12 million higher than those in 1973. Sales and production of individual mineral types varied significantly. Production of amosite, and anthophyllite decreased, whereas production of Cape Blue crocidolite and chrysotile increased. Transvaal Blue asbestos was not produced in 1974.

**Cement.**—Production and sales of cement increased 6.3% and 10%, respectively, in 1974 mainly because of continued high activity in the construction area. Profitability continued to be squeezed by rising costs, but a price increase granted in December offset rising production costs to some extent. Pretoria Portland Cement Co. Ltd. commissioned a new kiln at its Hercules factory and completed modernization of the 500,000-ton-per-year De Hoek plant of the company's subsidiary, Cape Portland Cement Co. Ltd. Anglo-Alpha Cement Ltd. planned to expand its Dudfield factory over the next few years, adding two additional kilns at a cost of $33 million.

Domestic and foreign sales of limestone increased by 6% to 14.9 million tons in 1974, compared with 14.1 million tons in 1973. Although local sales were higher in 1974, stocks of limestone were 5.2 million tons at yearend. Although lime output and demand decreased slightly in 1974, Union Lime Co. Ltd. was accelerating the construction program of the new lime plant at Ouplaas. The first kiln was expected to be commissioned by mid-1975 and the second by mid-1976. Cost of the program was estimated at $32 million.

**Diamond.**—Diamond sales by the Central Selling Organization (CSO) at $1.25 billion were $106 million, or 7.8%, lower in terms of rands than in 1973. Sales set a new record in the first half of 1974 but fell sharply in the latter half of the year because of marked deterioration in world economic conditions. The value of diamond stocks held by CSO increased $80 million to $397 million in 1974. South African diamond production was 7,510,074 carats, 55,300 carats less than in 1973. The value of sales was $210 million on sales of 7,071,434 carats, compared with a value of $235 million on sales of 7,277,866 carats in 1973. Diamond production by DeBeers Consolidated Mines Ltd. decreased slightly in 1974, mainly because operations at both the Finch and Koffiefontein mines were adversely affected by rain early in the year. Despite resumption of production at the Bultfontein mine, diamond output by the Kimberley Division decreased owing to the mining of lower ore grades at the DeBeers, Dutoitspan, and Wesselton mines. Production of the Namaqualand Division mines was 245,147 carats higher in 1974 due to higher output at Dreyers Pan.

**Table 10.—Republic of South Africa: Diamond production of De Beers Consolidated Mines, Ltd.**
(Carats)

| Mine | 1973 | 1974 |
|---|---|---|
| De Beers | 163,159 | 126,492 |
| Bultfontein | -- | 73,968 |
| Dutoitspan | 259,895 | 234,517 |
| Finsch | 2,495,096 | 2,353,413 |
| Koffiefontein | 373,174 | 341,978 |
| Namaqualand mines | 532,820 | 777,967 |
| Premier | [1] 2,501,689 | 2,422,326 |
| Wesselton | 481,603 | 449,561 |
| Total | 6,807,436 | 6,780,222 |

[1] Source: De Beers Consolidated Mines Ltd. Annual Report, 1974, p. 19.

Table 11.—Republic of South Africa: Diamond production, by Province
(Carats)

| Province | 1973 | | | 1974 | | |
|---|---|---|---|---|---|---|
| | Mine | Alluvial | Total | Mine | Alluvial | Total |
| Transvaal | 2,634,957 | 25,540 | 2,660,497 | 2,539,873 | 16,958 | 2,556,831 |
| Cape | 3,512,012 | 931,435 | 4,443,447 | 3,375,932 | 1,157,928 | 4,533,860 |
| Orange Free State | 461,017 | 413 | 461,430 | 419,194 | 189 | 419,383 |
| Total | 6,607,986 | 957,388 | 7,565,374 | 6,334,999 | 1,175,075 | 7,510,074 |

Source: Republic of South Africa, Department of Mines. Quarterly Information Circular, Minerals. 1974, p. 1.

Table 12.—Republic of South Africa: Diamond sales, by Province

| Province | 1973 | | 1974 | |
|---|---|---|---|---|
| | Quantity (carats) | Value (thousands) | Quantity (carats) | Value (thousands) |
| Transvaal | 2,469,845 | $25,947 | 2,472,803 | $24,517 |
| Cape | 4,362,229 | 182,922 | 4,270,564 | 170,673 |
| Orange Free State | 445,792 | 25,751 | 328,067 | 15,106 |
| Total | 7,277,866 | 234,620 | 7,071,434 | 210,296 |

Source: Republic of South Africa, Department of Mines. Quarterly Information Circular, Minerals. 1974, p. 2.

**Fluorspar.**—Fluorspar production of all grades was 207,933 tons, 2,391 tons less than in 1973. Acid-grade fluorspar continued to be the principal product, accounting for 93% of the total production and 83% of local sales and exports.

Marico Fluorspar (Pty.) Ltd., a subsidiary of United States Steel Corp., continued development of its mine at Zeerust, Transvaal. Production was scheduled to begin late in 1975 with full-scale mine and beneficiation operations to start by early 1976. The plant was designed to produce 120,000 tons of acid-grade (97% $CaF_2$) and 50,000 tons of metallurgical-grade (92% $CaF_2$) concentrates per year.

Chemspar, Inc., a subsidiary of Phelps Dodge Corp., rehabilitated and brought into production in early 1974 the mine and mill purchased from Ottoshoop Holdings (Pty.) Ltd., in 1973 for $6 million. Output of acid-grade fluorspar was 12,000 tons in 1974; however, at yearend, the production rate was approaching the planned rate of 2,500 tons monthly.

Transvaal Consolidated Land and Exploration Co. Ltd. (TCL) was building a pilot plant near Zeerust to study the possibility of upgrading its large deposit of 15% $CaF_2$ ore. If the tests were favorable, TCL planned to start construction of a full-scale acid-grade plant.

**Phosphate.**—Production of phosphate ores increased almost fourfold, reaching 7.8 million tons in 1974. Domestic demand for phosphate rock for the manufacture of fertilizers and phosphoric acid continued to grow rapidly. Revenue from sales of phosphate increased from $21 million in 1973 to $25.4 million in 1974. Local sales increased by $3.4 million, whereas export sales rose from $56,000 in 1973 to more than $1 million in 1974.

The Phosphate Development Corp. Ltd. (FOSKOR) embarked on an expansion program costing $59 million to increase annual production of phosphate concentrate from 1 million tons to 2.8 million tons by 1977. The first phase of the program, involving the pumping of phosphate tailings from PMC's operation to the extended FOSKOR plant, was operating in 1974 and will increase concentrate production by 750,000 tons per year. Triomf Fertilizers (Pty.) Ltd. was erecting a plant at Richards Bay to manufacture phosphoric acid for export. The new plant was scheduled for commissioning in 1977. Fedmis (Pty.) Ltd. was also enlarging its Phalaborwa plant to increase output of phosphoric acid for export. Omnia Fertilizers (Pty.) Ltd. planned production of superphosphate for local markets in 1975 at its plant at Impala Platinum Ltd.

**Vermiculite.**—In 1974, PMC, the country's only vermiculite producer, produced a record 182,613 tons of vermiculite, 17% more than in 1973. Although the tonnage milled, 1,125,634 tons, was slightly less than in 1973, production increased because the company recovered substantial amounts of ore from the marginal ore stockpile.

## MINERAL FUELS

**Coal.**—Coal, which provides 75% of South Africa's total energy needs, assumed greater importance in 1974 as a low-cost energy source in lieu of oil. Increased emphasis was placed on the development of large-scale coal-fired powerplant projects, and the Government announced plans to build a second, much larger, oil-from-coal conversion plant. To meet both expected domestic and contracted export demand, the coal industry continued with mechanization and expansion programs, brought new mines into production, and planned new mining operations. Expansion of coal exports continued to be a controversial topic between producers and the Government. A new coal consumption and resource study, initiated by the Government late in 1974, was expected to form the basis for a revised coal export policy.

Coal production increased 7% to 66.1 million tons in 1974. Sales increased by 5% to 64.6 million tons, compared with 61.5 million tons in 1973. The increase was lower than expected and reflected the severe railcar shortage suffered by collieries throughout the year. About 97% of the coal sales were for domestic consumption. The apparent consumption of coal in South Africa by category was approximately as follows in 1974: Electricity (48%), commercial trade (25%), railways (11%), oil and gas-from-coal conversion (10%), and iron and steel (6%).

In December, the Government announced that a second oil-from-coal conversion plant, called SASOL II, was to be constructed by the South African Coal, Oil and Gas Corp. Ltd. (SASOL). The project, valued at $1.6 billion, was scheduled for completion in 1981. Plans called for a plant complex containing a coal gasification system, a liquefaction reactor system, chemical-petrochemical units, and support facilities. The proposed plant is planned to process 40,000 tons of coal per day into gasoline and diesel fuels, ethylene, ammonia, sulphur, and various coal-tar derivatives. A U.S. firm, Fluor Corp., will act as general contractor for the project.

Major efforts were underway to develop coalfields near developing and planned powerplant sites. AAC's Arnot underground mine and temporary open pit reached full production and in September produced a record output of 416,000 tons. On completion of the new dragline in 1975, the colliery was expected to have the capacity to supply 6 million tons of coal per year to the adjoining Arnot powerstation of ESCOM. AAC also brought its large Kriel colliery, Transvaal, into preliminary production late in 1974. This operation will supply coal to ESCOM's newly developing 3,000-megawatt Kriel powerstation beginning in 1975. When the powerstation is completed in 1980, 8.5 million tons per year of Kriel colliery coal will be consumed. New coal mines or extensions to existing mines were planned or under development to supply several other ESCOM coal-fired powerstations being constructed in the Transvaal.

Government approval was given to AAC's Coronation Collieries to export to Japan 850,000 tons of low-ash coal per year for a period of 5 years from the second half of 1976 and 500,000 tons yearly for a further 5-year period after that.[15] According to its annual report, AAC was successful in obtaining conditional approval from the Government for the export of 100 million tons of coal over a period of 20 years, which together with approvals to other companies could result in coal exports reaching 40 million tons per year by the mid-1980's.

**Petroleum.**—South Africa's hopes of finding oil were raised in February when natural gas was discovered by Chevron Oil Co. of South-West Africa about 180 kilometers off the Orange River mouth. Although the discovery was not thought to be economic, the gas shows were encouraging enough to justify further exploration in the area.[16] The Government planned to increase the budget of the Southern Oil Exploration Corp. (Pty.) Ltd. (SOEKOR) in 1975 from $11 million to about $30 million to expand oil exploration activities on both the land and the Continental Shelf. Plans called for offshore drilling by two rigs instead of one in 1975 and for the hiring of two additional rotary rigs to drill on land. SOEKOR also announced that extensive marine seismic surveys were to continue to 1976 to provide planning for drilling work after 1976.

[15] South African Mining & Engineering Journal. Coal Exports Approved. V. 88, No. 4098, November 1974, p. 47.

[16] Coal, Gold and Base Metals. Orange River Gas Strike. V. 22, No. 6, August 1974, pp. 105–106.

# The Mineral Industry of the Territory of South-West Africa

By James H. Jolly [1]

The mineral industry of the Territory of South-West Africa continued to be a major factor in the country's economy, accounting for about 50% of the gross domestic product value. Although statistics are not available, the value of mineral production was estimated at about $500 million.[2] Most of the production value was attributed to the operations of Tsumeb Corp. Ltd. and Consolidated Diamond Mines of South-West Africa Ltd. (CDM).

Exploration and development work continued at a high rate; however, some programs were deferred or were undergoing reevaluation at yearend because of lower metal prices and deteriorating world economic conditions. Major exploration and development interest continued to center on copper and uranium. The Asis Ost copper mine was nearing the production stage at yearend and production at the Otjihose copper deposit, which has reserves of 16 million tons of 2% copper ore, was expected to begin in August 1975. Plans to develop a copper-zinc deposit near Okahandja were deferred by Falconbridge Nickel Mines Ltd. (FNM) due to the dramatic fall in copper prices during the second half of 1974. Other potential copper deposits in the Territory were being evaluated or were being considered for development.

Development of the world's largest uranium mine at Rössing continued on schedule. The operation, which will initially involve mining at a rate of 120,000 tons of ore and overburden daily, was expected to come onstream in 1976. The deposit was reported to have sufficient ore reserves to support mining operations for more than 25 years.

The search for exploitable oil and gas continued without success. Gas shows in an offshore well drilled 180 kilometers west of the Orange River mouth, however, raised government hopes of finding oil. No drilling was expected in 1975, but the Government planned a comprehensive drilling program to evaluate the country's offshore petroleum potential beginning in 1976.

## PRODUCTION AND TRADE

The South-West Africa Administration, Republic of South Africa, continued its policy of not disclosing mineral production statistics for the Territory. Most of the statistical data on production were derived from annual reports of companies operating in the country, mainly Tsumeb Corp., CDM, and the South-West Africa Co. Ltd. (SWACO). The Territory traditionally produces a large variety of minerals, particularly nonmetals, but output data are not available and these commodities are not listed in table 1.

The production of mineral commodities generally declined in the Territory in 1974. The mining of lower grade ores, mainly by Tsumeb, resulted in reduced

[1] Physical scientist, Division of Nonferrous Metals.

[2] Where necessary, values have been converted from South African Rand (R) to U.S. dollars at a rate of R1=US$1.471 (average of monthly averages as given in volumes 26 and 27 of International Financial Statistics). The rate in 1973 was R1=US$1.445.

mine production of lead, silver, and copper. The smelter output of each, however, continued to exceed mine production because of custom refining of imported concentrate. Increased open pit mining at the Rosh Pinah mine and the processing of higher grade ores at SWACO's Berg Aukas operation led to higher zinc production, despite declining zinc recovery by Tsumeb. Vanadium production also rose substantially because of the higher grade ores mined at Berg Aukas. The Territroy's tungsten output increased sevenfold owing to production from the reopened Krantzberg tungsten deposit near Omaruru. Diamond production decreased slightly but the value of production rose substantially.

**Table 1.—South-West Africa: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| METALS [2] | | | |
| Arsenic, white [3] | 2,370 | 8,147 | 6,640 |
| Cadmium: | | | |
| Mine output, metal content, recoverable | 199 | 131 | 126 |
| Metal, refined | 157 | 104 | 114 |
| Copper: | | | |
| Mine output, metal content, recoverable | [r] 26,186 | 34,168 | 32,478 |
| Metal, blister | 26,119 | 36,049 | [4] 46,612 |
| Lead: | | | |
| Mine output, metal content, recoverable | 59,990 | 61,694 | [5] 57,371 |
| Metal, refined | 63,961 | 63,592 | 64,342 |
| Silver: | | | |
| Mine output, metal content, recoverable thousand troy ounces | [r] 1,360 | 1,563 | [6] 1,556 |
| Smelter output, content of blister copper do | 1,679 | 1,998 | 2,395 |
| Tin, mine output, metal content, recoverable long tons | 979 | 770 | 769 |
| Tungsten, mine output, metal content, recoverable | 89 | 22 | [e] 155 |
| Vanadium, mine output, metal content, recoverable | 529 | 649 | 819 |
| Zinc, mine output, metal content | 34,742 | 37,919 | [5] 41,669 |
| NONMETALS | | | |
| Diamond: [7] | | | |
| Gem thousand carats | 1,516 | 1,520 | 1,491 |
| Industrial do | 80 | 80 | 79 |
| Total do | 1,596 | 1,600 | 1,570 |
| Lithium minerals: [8] | | | |
| Amblygonite | 3,747 | 51 | 60 |
| Lepidolite | | 3,500 | 4,500 |
| Petalite | | 3,500 | 1,500 |
| Pyrite concentrates: | | | |
| Gross weight | -- | 12,183 | 9,566 |
| Sulfur content | -- | 5,540 | 4,480 |
| Salt | [e] 110,000 | 147,000 | 209,000 |
| Wollastonite | NA | [8] 1,800 | [8] 1,000 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, South-West Africa, prior to 1967, produced bismuth concentrates, cesium ore, columbite-tantalite concentrates, gold, manganese ore, molybdenum concentrates, graphite, lime, mica, precious stones, kyanite, sillimanite, and a variety of crude construction materials (clays, stone, and gravel). No official statistics have been published since yearend 1966, and available information is inadequate to ascertain whether production has continued or not, and if so, at what levels.

[2] Data are compiled from operating company reports as follows: Tsumeb Corp. Ltd. (arsenic, mine and refined cadmium, mine and blister copper, mine and refined lead, mine and smelter silver, mine zinc, and pyrite concentrate); South-West Africa Co. Ltd. (mine lead, mine tin, mine tungsten, mine vanadium, and mine zinc); South African Iron and Steel Industrial Corp. Ltd. (ISCOR) for Imcor Zinc (Pty.) Ltd's Rosh Piah mine (mine lead and mine zinc), and for ISCOR's own Uis mine (mine tin); General Mining and Finance Corp. Ltd. for Klein Aub Koper Maatskappy Ltd.'s mine near Rehoboth (mine copper and mine silver); and Falconbridge Nickel Mines Ltd. for Oamites Mining Co. (Pty). Ltd., Oamites mine (mine copper). Data from Tsumeb Corp. Ltd and Falconbridge Nickel Mines Ltd. are for calendar years, data from other companies for fiscal years ending June 30 of the year stated.

[3] White arsenic equivalent of all arsenic products reported as being produced.

[4] Figure comprises reported production of Tsumeb Corp. Ltd. and Oamites Mining Co. (Pty.) Ltd. plus an estimate for Klein Aub Koper Maatskappy Ltd.

[5] Figure comprises reported production of Tsumeb Corp. Ltd. and South-West Africa Co. Ltd. plus an estimate for Rosh Pinah mine.

[6] Figure comprises reported production of Tsumeb Corp. Ltd. plus an estimate for Klein Aub Koper Maatskappy Ltd.

[7] Total figures reported by DeBeers Consolidated Mines Ltd. in company annual reports for calendar years; detail on gem and industrial diamonds are estimates, assuming output to be 95% gem quality.

[8] Data for 1972 are estimated, based on recorded imports by selected countries from the statistical territory of South Africa (Republic of South Africa, Territory of South-West Africa. Botswana, Lesotho, and Swaziland) minus known production from the Republic of South Africa. (There is no known production in Botswana, Lesotho, or Swaziland) Data for 1973 and 1974 areas reported in World Mining, June 25, 1975, p. 147.

## COMMODITY REVIEW

### METALS

Tsumeb Corp., operators of three major base metal mines, mined and milled copper, lead, and zinc ores and operated the Territory's only lead and copper smelters. Metal sales of $106.8 million, including $26.3 million from custom material, were 24% (in terms of rand) higher than those of 1973 and almost 96% higher than those of 1972. Concentrate output was lower owing to smaller ore production and generally lower ore grades. Tsumeb smelters produced 46,612 tons of blister copper and 64,342 tons of refined lead, compared with 36,049 tons of blister copper and 63,592 tons of lead in 1973. Both smelters consumed increasing amounts of custom concentrates. Although some of the custom material was domestically produced, most was imported from sources outside the Territory.

Table 2.—South-West Africa: Operations of Tsumeb Corp. Ltd.

| | 1973 | 1974 |
|---|---|---|
| Tsumeb mine and mill: | | |
| Ore mined, gross weight ---------- metric tons -- | 448,271 | 421,204 |
| Ore milled, gross weight ---------- do ---- | 448,271 | 421,204 |
| Metal content: | | |
| Copper ---------- percent -- | 4.10 | 4.36 |
| Lead ---------- do ---- | 11.51 | 10.06 |
| Zinc ---------- do ---- | 2.65 | 2.30 |
| Silver ---------- ounces per metric tons -- | 2.96 | 3.15 |
| Concentrate production: | | |
| Lead concentrate: | | |
| Gross weight ---------- metric tons -- | 115,811 | 99,472 |
| Metal content: | | |
| Copper ---------- percent -- | 7.67 | 7.70 |
| Lead ---------- do ---- | 39.55 | 37.23 |
| Zinc ---------- do ---- | 4.83 | 4.83 |
| Silver ---------- ounces per metric ton -- | 5.14 | 5.69 |
| Copper concentrate: | | |
| Gross weight ---------- metric tons -- | 18,650 | 22,929 |
| Metal content: | | |
| Copper ---------- percent -- | 43.29 | 42.00 |
| Lead ---------- do ---- | 12.24 | 11.54 |
| Silver ---------- ounces per metric ton -- | 32.76 | 29.51 |
| Zinc concentrate: | | |
| Gross weight ---------- metric tons -- | 5,933 | 2,908 |
| Metal content: | | |
| Zinc ---------- percent -- | 52.31 | 52.76 |
| Cadmium ---------- do ---- | 1.11 | .98 |
| Mill recovery (from all concentrates): | | |
| Copper ---------- percent of metal in ore milled -- | 92.14 | 94.19 |
| Lead ---------- do ---- | 93.20 | 93.60 |
| Zinc [1] ---------- do ---- | 26.16 | 15.86 |
| Kombat mine and mill: | | |
| Ore mined and milled: | | |
| Gross weight ---------- metric tons -- | 363,740 | 353,070 |
| Metal content: | | |
| Copper ---------- percent -- | 1.67 | 1.19 |
| Lead ---------- do ---- | 1.88 | 2.62 |
| Silver ---------- ounces per metric ton -- | .58 | .42 |
| Concentrate production: | | |
| Copper concentrate: | | |
| Gross weight ---------- metric tons -- | 16,854 | 12,824 |
| Metal content: | | |
| Copper ---------- percent -- | 29.12 | 21.68 |
| Lead ---------- do ---- | 5.79 | 7.22 |
| Silver ---------- ounces per metric ton -- | 7.85 | 5.69 |
| Lead concentrate: | | |
| Gross weight ---------- metric tons -- | 9,540 | 14,854 |
| Metal content: | | |
| Copper ---------- percent -- | 8.81 | 7.90 |
| Lead ---------- do ---- | 57.32 | 51.92 |
| Silver ---------- ounces per metric ton -- | 3.05 | 2.50 |
| Mill recovery (from all concentrates): | | |
| Copper ---------- percent of metal in ore milled -- | 94.55 | 93.99 |
| Lead ---------- do ---- | 94.41 | 93.27 |
| Matchless mine and mill: | | |
| Ore mined and milled: | | |
| Gross weight ---------- metric tons -- | 102,036 | 108,344 |

See footnotes at end of table.

Table 2.—South-West Africa: Operations of Tsumeb Corp. Ltd.—Continued

| | 1973 | 1974 |
|---|---|---|
| Matchless mine and mill—Continued | | |
| Ore mined and milled—Continued | | |
| Metal content: | | |
| Copper ---------- percent -- | 2.23 | 1.93 |
| Sulfur ---------- do ---- | 13.77 | 15.63 |
| Concentrate production: | | |
| Copper concentrate: | | |
| Gross weight ---------- metric tons -- | 9,325 | 8,248 |
| Metal content: | | |
| Copper ---------- percent -- | 20.95 | 22.68 |
| Sulfur ---------- do ---- | e 36.60 | 17.31 |
| Pyrite concentrate: | | |
| Gross weight ---------- metric tons -- | 12,183 | 9,566 |
| Metal content: | | |
| Copper ---------- percent -- | 2.12 | 1.68 |
| Sulfur ---------- do ---- | 45.47 | 46.83 |
| Mill recovery (from all concentrates): | | |
| Copper ------ percent of element in ore milled -- | 97.07 | 96.93 |
| Sulfur ---------- do ---- | 63.71 | 43.76 |
| Smelting and refining: | | |
| Copper concentrates smelted [2] ---------- metric tons -- | 40,251 | 47,027 |
| Average assay: | | |
| Copper ---------- percent -- | 33.56 | 32.39 |
| Lead ---------- do ---- | 7.50 | 7.98 |
| Silver ---------- ounces per metric ton -- | 16.78 | 17.04 |
| Lead concentrates smelted [2] ---------- metric tons -- | 126,764 | 114,133 |
| Average assay: | | |
| Copper ---------- percent -- | 7.81 | 7.68 |
| Lead ---------- do ---- | 40.84 | 39.24 |
| Silver ---------- ounces per metric ton -- | 5.11 | 5.30 |
| Custom materials smelted: | | |
| Copper concentrate ---------- metric tons -- | 29,893 | 47,362 |
| Average assay: | | |
| Copper ---------- percent -- | 44.60 | 47.09 |
| Lead ---------- do ---- | .98 | 1.73 |
| Silver ---------- ounces per metric ton -- | 12.22 | 14.88 |
| Lead concentrate ---------- metric tons -- | 20,928 | 32,277 |
| Average assay: | | |
| Copper ---------- percent -- | 3.21 | 3.59 |
| Lead ---------- do ---- | 62.20 | 59.09 |
| Silver ---------- ounces per metric ton -- | 12.89 | 13.66 |
| Metal sales: | | |
| Value ---------- thousands -- | $84,611 | $106,795 |
| Quantity: | | |
| Arsenic, refined $As_2O_3$ [3] ---------- metric tons -- | r 8,147 | 6,640 |
| Cadmium ---------- kilograms -- | 198,654 | 132,708 |
| Copper, electrolytic ---------- metric tons -- | 29,459 | 31,424 |
| Lead ---------- do ---- | 67,349 | 60,852 |
| Silver ---------- troy ounces -- | 1,910,409 | 2,215,911 |
| Zinc ---------- metric tons -- | 2,807 | 1,836 |

e Estimate. r Revised.
[1] The lower recovery of zinc (to zinc concentrates) was due mainly to the shutting down of the zinc circuit on days when zinc heads were too low for economical operation.
[2] Concentrates from Tsumeb Corp. Ltd.
[3] Production.

Exploration and development continued at the Tsumeb, Kombat, and Matchless mines, as well as the new Asis Ost mine. Positive ore reserves in the Tsumeb mine increased substantially in 1974 as additional reserves between the 36 and 38 levels were proven by diamond drilling. Exploration drilling on the 44 level continued but no significant mineralization was intersected. In 1974, 39% of production at the Tsumeb mine came from stopes and pillars above the 30 level, 54% from the 32 and 34 levels, and 7% from the 35 level. At Kombat a reappraisal reduced the total tonnage of ore reserves but improved the overall grade. Deep exploration drilling from the 8 level haulage continued with moderately encouraging results. Ore reserves at the Matchless mine increased but exploration drilling at adjacent prospects was disappointing. At Asis Ost, a joint venture of Tsumeb and SWACO, ore reserves remained unchanged, mine development continued, and 5,730 tons of development ore, produced in the latter half of 1974, was processed at the Kombat mill.

Tsumeb Corp. continued exploration

of numerous prospects in various parts of the Territory, both independently and jointly with SWACO. At Asis West, immediately west of the Kombat mining area, drilling intersected a potentially minable, mineralized zone. Additional exploration drilling in the prospect area was planned in 1975.

Table 3.—Ore reserves of Tsumeb Corp. Ltd.[1]

| | Quantity (metric tons) | Grade (percent) | | | |
|---|---|---|---|---|---|
| | | Copper | Lead | Zinc | Sulfur |
| Positive ore: | | | | | |
| Tsumeb | 5,491,971 | 4.56 | 7.79 | 2.06 | -- |
| Kombat | 1,082,780 | 1.91 | 3.32 | -- | -- |
| Matchless | 1,134,297 | 2.28 | -- | -- | 13.11 |
| Asis Ost | 440,500 | 2.57 | .46 | -- | -- |
| Probable ore: | | | | | |
| Tsumeb | 2,549,848 | 2.33 | 1.87 | .78 | -- |
| Kombat | 981,018 | 1.77 | 2.03 | -- | -- |
| Matchless | 284,204 | 2.30 | -- | -- | 11.30 |
| Tentative ore: | | | | | |
| Tsumeb | 772,652 | 4.47 | 5.16 | 1.96 | -- |
| Kombat | 123,277 | 1.73 | 2.47 | -- | -- |
| Matchless | 1,361,297 | 2.36 | -- | -- | 14.35 |
| Asis Ost | 288,000 | .70 | 1.80 | -- | -- |

[1] As of Dec. 31, 1974.

**Arsenic.**—The Tsumeb arsenic plant roasted 20,074 tons of reverberatory and converter baghouse dusts, dross skims, and storage material in 1974, producing 6,722 tons of arsenic trioxide material of various grades. About 7,370 tons of pyrite concentrate from the Matchless mine was used as roaster flux. Estimated arsenic production was 18% lower than the record output of 1973. Sales of arsenic trioxide material were 5,399 tons, slightly less than in 1973.

**Cadmium.**—Tsumeb Corp. processed 4,563 tons of sinter baghouse dust in 1974, producing 114 tons of refined cadmium, 10 tons more than in 1973.

**Copper.**—The Oamites Mining Co. (Pty.) Ltd., a joint venture of FNM and the International Development Corp. (IDC), a Republic of South Africa Government agency, produced about 9% less copper in 1974 than in 1973 despite milling 11% more ore. The ore grade declined significantly because much of the ore production came from peripheral areas of the ore body where the vein widths were less and ore dilution higher. The company was developing deeper mine levels to achieve grade improvement. Production statistics for the Oamites mine for 1973 and 1974 follow:

| | 1973 | 1974 |
|---|---|---|
| Ore milled ---------- tons -- | 556,000 | 617,000 |
| Mill head grade - percent Cu -- | 1.35 | 1.13 |
| Mill recovery ------ percent -- | 92.98 | 91.32 |
| Concentrates produced dry tons -- | r 20,000 | 19,000 |
| Recoverable copper --- tons -- | 6,997 | 6,356 |

r Revised.

Development of the Otjihase copper deposit by Johannesburg Consolidated Investment Co. Ltd. (JCI) and Minerts Development (Pty.) Ltd., continued on schedule despite low copper prices prevailing at yearend. JCI and Minerts were investing about $26 million to establish mine and mill facilities for a 100,000-ton-per-month operation. Production from the deposit, which has 16 million tons of ore averaging about 2% copper with some zinc and silver, was expected to begin in August 1975.

Noranda Mines Ltd. began exploratory drilling on Laurasia Resources Ltd.'s Longbeen copper prospect near Windhoek early in the year. Three mineralized zones, each 30 to 50 feet in width and up to 3,000 feet long with surface assays that vary from less than 1% to 4% copper, were to be explored.[3]

Falconbridge Explorations Ltd., a sub-

[3] Financial Times. Laurasia in S.W. Africa. No. 26,280, Feb. 5, 1974, p. 22.

sidiary of FNM, completed an exploration drilling program in 1974 at its copper-zinc sulfide deposit on the farm Elbe, near Okahandja. Estimated reserves were about 4 million tons grading 1.5% copper, with some zinc and silver values.[4] Plans to bring the property into production in about 2 years at a cost of $13 million were deferred at the end of the year because of the dramatic fall in copper prices and deteriorating worldwide economic conditions.

FNM also reported finding significant sulfide mineralization in the same area as Elbe, at its Swartmodder prospect. Drilling to evaluate the discovery was underway.

**Lead, Zinc, and Vanadium.**—Concentrate production at the Berg Aukas operation of SWACO increased almost 20% over that of fiscal 1973. Although the mill and treatment plant operated at last year's level, production of all four concentrates increased due mainly to the mining of higher grade vanadiferous-cavity-fill material from the 17 level and richer sulfide ore from normal mining operations. Production statistics for the Berg Aukas mine in fiscal 1974 follow:

| | Quantity (metric tons) | | Grade (percent) | | |
|---|---|---|---|---|---|
| | 1973 | 1974 | $V_2O_5$ | Lead | Zinc |
| Ore hoisted | 171,200 | 172,300 | 1.14 | 4.7 | 20.0 |
| Ore milled | 135,600 | 135,000 | 1.42 | 5.7 | 25.0 |
| Concentrates: | | | | | |
| Lead vanadates | 6,576 | 8,348 | 17.51 | 42.9 | 18.6 |
| Zinc sulfide | 6,988 | 11,436 | -- | 3.0 | 56.8 |
| Lead sulfide | 919 | 1,214 | -- | 55.4 | 19.9 |
| Zinc silicates | 27,930 | 29,710 | -- | 3.4 | 46.8 |

The company continued development of the ore bodies below the 14 level, mostly on the 17 level. The establishment of the 19 level was completed and the main mine workings were dewatered to this horizon. No. 2 shaft was deepened to a position about 30 meters above 23 level. The ore reserves at the end of fiscal 1974, as indicated by drilling, were as follows in thousand metric tons:

| Locality | | Grade (percent) | | |
|---|---|---|---|---|
| | | $V_2O_5$ | Pb | Zn |
| No. 1 shaft | 125 | 0.7 | 4 | 19 |
| No. 2 shaft | 1,395 | .4 | 5 | 16 |
| Possible No. 2 shaft | 310 | .5 | 3 | 20 |
| Total mine 1974 | 1,830 | .5 | 4 | 17 |
| Total fiscal 1973 | 1,800 | .5 | 5 | 17 |

The Rosh Pinah mine of Imcor Zinc (Pty.) Ltd., (Imcor) a subsidiary of South African Iron and Steel Industrial Corp. (ISCOR), produced 26,300 tons of zinc concentrate and 7,700 tons of lead concentrate, compared with 29,700 tons and 8,100 tons, respectively, in fiscal 1973. Production from its new open pit mine reached 100,000 tons of ore and waste early in 1974. Ore reserves in the underground mining area were expected to be depleted by September 1976 and Imcor planned to increase the open pit tonnage to 160,000 tons by August 1976. Improvement in the grade of ore mined to 10% combined metals (zinc, lead, copper, and silver) was expected in 1975.

**Silver.**—Domestic production of silver, a byproduct of copper and lead mining, declined slightly from that of 1973; however, total output increased due to increased custom smelting of imported concentrate. Tsumeb Corp. continued to be the largest silver producer in the Territory, recovering 1,325,407 ounces in company-produced concentrates. Virtually all silver produced in the country was processed by Tsumeb, which exported the silver in the form of blister copper and doré bullion for toll refining elsewhere. In 1974 sales of silver by Tsumeb were 2,215,911 ounces, valued at about $10.4 million.

**Tin-Tungsten.**—Nordex Joint Venture Ltd., owned by Nord Resources Corp. (40%) and Ebco Mining Co. (60%), was the only tungsten producer in the Territory in 1974. Nordex produced about 280 tons of 70% tungsten-trioxide concentrate at its Krantzberg tungsten deposit near Omaruru. A new ore zone was under development and was planned for mining in 1976. Ore reserves, grading 0.6% tungsten trioxide, were reportedly sufficient for a 7- to 10-year operation.

SWACO's Brandberg West tin-tungsten mine, which closed in 1973, remained on a care-and-maintenance basis. Exploratory drilling continued and a decision on whether to recommence waste stripping operations was expected early in 1975. The ore reserves of the mine were estimated at 6 million tons, grading 0.153% tin and 0.079% tungsten.

Tin was produced only at the Uis mine operated by ISCOR in 1974. Concentrate production was 1,220 long tons contain-

[4] Engineering and Mining Journal. V. 175, No. 6, June 1974, p. 240.

ing 769 long tons of tin, 120 tons more than that reported in fiscal 1973. All of the concentrate was shipped to ISCOR's Vanderbijlpark Steel Works in the Republic of South Africa for processing.

**Uranium.**—Rössing Uranium Ltd., a joint venture of Rio Tinto South Africa, Ltd., IDC, General Mining and Finance Corp., Total Compagnie Minière et Nucleaire, and Rio Algom Mines Ltd., continued development of its large, open pit uranium mine 48 kilometers east of Swakopmund. Development costs were put at $132 million, most of which, through 1974 were supplied by IDC. Production was scheduled to begin in 1976 at an initial rate of 60,000 tons of ore per day yielding about 15 million pounds of $U_3O_8$ per year, making the mine the world's largest producer of uranium. Facilities to operate at the planned production rate, 120,000 tons of ore per day, were expected to be completed by 1980. $U_3O_8$ reserves are estimated to exceed 100,000 tons ($10 per pound $U_3O_8$), sufficient for at least 25 years operation.[5]

## NONMETALS

**Diamond.**—Diamond production continued to be the largest contributor to the mining industry of the Territory. Production by CDM, producer of virtually all of the diamond recovered in the country, decreased almost 30,000 carats to 1.57 million carats in 1974 due mainly to a decline in diamond grade. The cost of mining and processing a ton of gravel rose 46% (in terms of rand) to $4.04 due to wage increases, higher costs for equipment and stores, and an 18% increase in the amount of overburden stripped.

Development of the Western Block continued. In the foreshore area, the use of a well point dewatering system for maintaining slope stability of the seawall enabled mining to be extended to a distance of 120 meters seaward of the high water mark. A bucketwheel excavator and conveyor bridge system was being installed in the Western Block where the stripping ratio is high. The system, which is scheduled to start operations in April 1975, was expected to reduce the cost of overburden removal 30% below that of other methods used to date.[6] The total area of overburden to be removed by the system is 10,533 million square meters, and an average of about 14 cubic meters of overburden will have to be removed to expose 1 square meter of diamondiferous material. A total of 147 million cubic meters are scheduled for stripping over a period of 12 years.

Two additional conglomerate treatment plants were under construction. The No. 2 plant was nearing completion and was to be commissioned early in 1975. Processing water for the No. 2 plant is obtained through a shaft and tunnel system that extends into the sea.[7] The system has a maximum throughput of 70 million liters of seawater per day. Construction of the No. 3 conglomerate plant, which is about 8 kilometers north of the No. 4 plant, started in September and commissioning was scheduled for 1976.

The new X-ray recovery facility at the No. 4 plant was onstream in September. This facility is designed to handle the entire production from the four conglomerate treatment plants.

In 1975 CDM planned an extensive program to prospect the Orange River at geologically favorable points for payable deposits of diamonds. The gravels will be treated in a 50-ton-per-hour plant.

[5] Metal Bulletin Monthly. South Africa: The Progress Years. No. 45, September 1974, p. 27.
[6] Coal, Gold, and Base Metals. Overburden Removal Will Be Reduced by 30 Percent. V. 22, No. 4, June 1974, pp. 37, 39, 41, 43.
[7] Coal, Gold, and Base Metals. Underseas Tunnel for CDM. V. 22, No. 9, November 1974, pp. 33, 35.

Table 4.—South-West Africa: Operations of the Consolidated Diamond Mines of South-West Africa, Ltd.

| Operation | | 1973 | 1974 |
|---|---|---|---|
| Overburden stripped-bank | thousand tons | e 37,270 | 45,447 |
| Gravels mined and screened | do | 11,630 | 11,840 |
| Carats recovered | | 1,599,565 | 1,569,961 |
| Mining grade | carats per 100 tons | 13.75 | 13.26 |
| Average diamond size | carats per stone | .88 | .88 |
| Cost per ton of gravels mined and screened | dollars | 2.44 | 4.04 |
| Cost per carat recovered | do | 19.80 | NA |

e Estimate. NA Not available.

## MINERAL FUELS

**Petroleum.**—The Territory's hopes for finding oil were raised in February when natural gas was discovered by Chevron Oil Co. of South-West Africa in block 12, in a well drilled by the Sedco 135 about 180 kilometers off the Orange River mouth. Although the discovery was not thought to be economic, the gas shows were encouraging enough to justify further exploration in the area.[8] No drilling activity was expected in 1975 because drill rigs were not available. Southern Oil Exploration Corp. (South-West Africa) (Pty.) Ltd. (SWAKOR), an agency of the South-West Africa Administration, however has contracted for additional offshore drilling in 1976.

Damson Oil Co. obtained a one-third interest in block 9, which adjoins block 12, from Aracca Petroleum Co. Other interest holders in the lease include Aminex, Ltd.; Asmera, Ltd.; and Canadian Southern Petroleum, Ltd., all of Canada.[9]

Getty Oil Co. and Phillips Petroleum Co. were dropping their 21,300-square-mile deepwater prospecting lease, blocks 15 and 16, in 1975 mainly due to high geological and technical costs associated with deepwater exploration. The Continental Overseas Oil Co. withdrew from the consortium in November.[10]

[8] Coal, Gold, and Base Metals. Orange River Gas Strike. V. 22, No. 6, August 1974, pp. 105, 106.
[9] World Oil. V. 179, No. 3, Aug. 15, 1974, p. 142.
[10] Oil and Gas Journal. V. 72, No. 45, Nov. 11, 1974, p. 128.

# The Mineral Industry of Spain

By Scott F. Sibley [1]

An 18% annual rate of inflation and relatively high oil prices combined to reduce the annual growth rate of Spain's gross national product (GNP) from 8% in 1973 to an estimated 5% (in real terms) in 1974. Although the economy in the first half of the year roughly paralleled that of the same period in 1973, Spain experienced a downward trend in many facets of the economy in the second half. Statistics for indicators such as employment, industrial production, and tourism compared unfavorably with second-half figures for 1973, reflecting the worldwide economic situation.

However, for the year, declines were shown only in industrial production (—0.7%) and new car registrations (—3.3%). The balance-of-trade deficit of $8.4 billion [2] was perhaps the most prominent sign of a worsening economic picture. Combined with declines in both tourism and remittances from emigrant workers, the balance of payments went from a surplus of $500 million in 1973 to a deficit of about $3.5 billion. Nevertheless, Spain's monetary reserve position remained strong throughout 1974.

Despite these problems, consumer demand was expected to remain strong in 1975. The Government authorized wage increases at least equal to the rise in the cost of living and, in some cases, up to 3% more. Salaries during 1974 reportedly averaged about 26% above those of 1973, but labor problems such as strikes (particularly in the northern industrial areas) were troublesome to the economy. Primary goals set for 1975 were reducing both the balance-of-payments deficit and inflation.

Mineral exploration was booming in several different areas of Spain. These regions included the Huelva massive sulfide province in the southwest, the Murcia and Reocin-Soria lead-zinc provinces in the southeast and north, and Galicia in the northwest, where disseminated tin, tungsten, copper, and lead-zinc deposits are found. Part of the reason for this increased activity was the $25 million Spanish Mineral Exploration Plan, which was in its second year. In addition, more than 10 international mining companies were actively searching for minerals during the year.

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[1] Physical scientist, Division of Ferrous Metals.

[2] Where necessary, values have been converted from Spanish pesetas (Ptas) to U.S. dollars at the rate of Ptas1.00=US$0.017384.

## PRODUCTION

Commodities showing significant production gains in 1974 compared with those of 1973 were blister copper (37%), iron ore and concentrate (17%), primary zinc metal (21%), acid-grade fluorspar (13%), bituminous coal (4.8%), and crude steel (4.2%).

Spain's steel industry continued its healthy growth in 1974, moving into 9th place among the 23 members of the International Iron and Steel Institute, compared with 13th place in 1972. Spanish steel manufacturers produced about 11.3 million tons of steel in 1974.

## Table 1.—Spain: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite | 6,087 | 8,200 | e 8,500 |
| Metal: | | | |
| Primary | 143,241 | 167,867 | 188,795 |
| Secondary | 38,940 | 51,506 | e 52,000 |
| Antimony: | | | |
| Mine output, metal content | 138 | 114 | 276 |
| Metal (regulus) | r 263 | 560 | e 600 |
| Bismuth, mine output, metal content -- kilograms | 2,944 | 1,000 | e 1,500 |
| Cadmium, metal | 111 | 136 | 140 |
| Copper: | | | |
| Mine output, metal content | 36,117 | 39,483 | 38,075 |
| Metal: | | | |
| Blister | r 80,120 | 94,422 | 129,222 |
| Refined, primary: | | | |
| Thermal | 22,737 | 19,101 | NA |
| Electrolytic | r 75,652 | 83,879 | NA |
| Total | r 98,389 | 102,980 | e 120,700 |
| Refined secondary | 13,756 | 23,506 | e 25,000 |
| Gold, smelter output: | | | |
| Primary -- troy ounces | 11,574 | 18,905 | NA |
| Secondary -- do | 173,614 | NA | NA |
| Iron and steel: | | | |
| Iron ore and concentrate, gross weight -- thousand tons | 6,773 | 7,326 | 8,583 |
| Pig iron -- do | r 5,922 | 6,272 | 6,887 |
| Electric furnace ferroalloys -- do | r 175 | 241 | 266 |
| Crude steel -- do | r 9,536 | 10,809 | 11,258 |
| Semimanufactures -- do | 6,966 | 8,573 | e 9,500 |
| Lead: | | | |
| Mine output, metal content | 69,443 | 64,408 | 59,985 |
| Metal: | | | |
| Primary | 82,950 | 87,322 | 79,191 |
| Secondary | 3,853 | 3,920 | e 4,000 |
| Manganese ore and concentrate | 13,171 | 12,377 | e 12,000 |
| Mercury: | | | |
| Mine output, metal content -- 76-pound flasks | 53,994 | 60,076 | 57,059 |
| Metal -- do | 37,597 | NA | NA |
| Silver: | | | |
| Mine output, metal content -- thousand troy ounces | r 3,036 | 3,635 | e 3,600 |
| Metal: | | | |
| Primary -- do | 3,890 | 2,990 | 3,007 |
| Secondary -- do | r 2,141 | 2,067 | e 2,050 |
| Tin: | | | |
| Mine output, metal content -- long tons | 373 | 515 | 422 |
| Metal: | | | |
| Primary -- do | 4,686 | 5,724 | 6,063 |
| Secondary -- do | r 296 | 272 | e 270 |
| Titanium: | | | |
| Ilmenite concentrates: | | | |
| Gross weight | 22,483 | 3,727 | -- |
| Titanium dioxide content | 10,506 | 1,766 | -- |
| Titanium dioxide | 19,004 | 19,940 | 20,023 |
| Tungsten, mine output, metal content | r 362 | 313 | 300 |
| Uranium, mine output, $U_3O_8$ content | 150 | 196 | 44 |
| Zinc: | | | |
| Mine output, metal content | 89,433 | 94,454 | 93,734 |
| Metal: | | | |
| Primary | 99,658 | 107,070 | 129,448 |
| Secondary | 154 | 86 | NA |
| **NONMETALS** | | | |
| Barite | 89,546 | 94,000 | e 100,000 |
| Cement, hydraulic: | | | |
| Natural -- thousand tons | 134 | 127 | e 130 |
| Other -- do | 19,442 | 21,672 | 23,660 |
| Chalk -- cubic meters | 105,000 | 110,000 | NA |
| Clays: | | | |
| Bentonite | 43,115 | 47,629 | e 48,000 |
| Kaolin, marketable: | | | |
| Crude | 74,089 | e 76,000 | e 76,000 |
| Washed | 135,491 | 136,384 | e 137,000 |
| Refractory | 378,066 | e 380,000 | e 380,000 |
| Other -- thousand cubic meters | r 6,414 | 6,000 | e 6,200 |
| Diatomite and tripoli | 19,189 | 20,000 | e 21,000 |
| Earths, industrial, n.e.s | 18,500 | 20,000 | NA |
| Feldspar and pegmatite | 62,987 | 65,000 | e 66,000 |
| Fertilizer materials: | | | |
| Crude potash salts, $K_2O$ equivalent | 637,591 | 570,614 | 495,267 |

See footnotes at end of table.

## Table 1.—Spain: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials—Continued | | | |
| Manufactured: | | | |
| Nitrogenous, nitrogen content - thousand tons | r 530 | 757 | 772 |
| Phosphatic, $P_2O_5$ content ---- do | 393 | 412 | 488 |
| Potassic, $K_2O$ equivalent ---- do | 533 | 474 | 396 |
| Fluorspar: | | | |
| Gross weight: | | | |
| Acid grade [1] | 312,685 | 285,117 | e 321,000 |
| Metallurgical grade [2] | 90,368 | e 100,000 | e 100,000 |
| Total | 403,053 | 385,117 | e 421,000 |
| Calcium fluoride content: | | | |
| Acid grade [1] | r 304,061 | 277,373 | e 311,000 |
| Metallurgical grade [2] | 52,390 | r e 70,000 | e 70,000 |
| Total | r 356,451 | 347,373 | e 381,000 |
| Gypsum and anhydrite, crude ---- thousand tons | 4,124 | 4,470 | e 4,400 |
| Kyanite and related materials, andalusite | 5,500 | 5,600 | e 5,700 |
| Lime (quicklime and hydrated lime) - thousand tons | 543 | 342 | e 350 |
| Magnesite, crude | 272,875 | 300,000 | 330,000 |
| Meerschaum (sepiolite), crude | 51,837 | 53,000 | NA |
| Mineral pigments, ocher | 10,602 | 10,000 | NA |
| Pumice | 150,459 | 177,218 | e 190,000 |
| Pyrite, including cupreous: | | | |
| Gross weight ---- thousand tons | 2,140 | 2,401 | 2,600 |
| Sulfur content ---- do | 1,001 | 1,128 | 1,206 |
| Salt: | | | |
| Rock ---- do | 1,215 | 1,273 | e 1,400 |
| Marine and other evaporated ---- do | 650 | 735 | e 800 |
| Sand and gravel: | | | |
| Sand, silica ---- thousand cubic meters | 622 | 500 | NA |
| Other ---- do | 6,677 | 7,000 | NA |
| Sodium compounds: | | | |
| Sodium carbonate, manufactured | 374,100 | 441,700 | e 445,000 |
| Sodium sulfate: | | | |
| Natural: | | | |
| Glauberite, $Na_2SO_4$ content | 22,779 | 42,594 | e 130,000 |
| Thenardite, $Na_2SO_4$ content | 79,595 | 81,240 | e 130,000 |
| Manufactured | 108,540 | 114,000 | e 120,000 |
| Stone: | | | |
| Calcareous: | | | |
| Dolomite ---- thousand cubic meters | 712 | 800 | |
| Limestone ---- do | 31,530 | 40,000 | |
| Marble ---- do | 177 | 200 | |
| Marl ---- do | 2,408 | 2,500 | |
| Basalt ---- do | 818 | 900 | |
| Diabase ---- do | 5 | 11 | |
| Granite ---- do | 2,693 | 3,000 | |
| Ofite ---- do | 168 | 170 | |
| Phonolite ---- do | 138 | 140 | NA |
| Porphyry ---- do | 31 | 33 | |
| Quartz ---- thousand tons | 383 | 510 | |
| Quartzite ---- thousand cubic meters | 248 | 260 | |
| Sandstone ---- do | r 907 | 900 | |
| Serpentine ---- do | r 28 | 25 | |
| Slate ---- do | 214 | 250 | |
| Trachyte ---- do | 98 | 100 | |
| Trass and tufa ---- do | 212 | 250 | |
| Strontium minerals | 8,000 | 8,000 | e 8,000 |
| Sulfur, byproduct: | | | |
| Elemental from petroleum | 2,747 | 1,588 | e 1,600 |
| From lignite gasification | 1,260 | 1,381 | e 1,400 |
| From metallurgy | 104,000 | e 110,000 | e 110,000 |
| Talc and steatite | 40,358 | 40,134 | e 41,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 18,100 | 16,330 | NA |
| Carbon black | 56,700 | 50,183 | 54,755 |
| Coal: | | | |
| Anthracite ---- thousand tons | 3,005 | 2,986 | 2,925 |
| Bituminous ---- do | 8,001 | 6,976 | 7,316 |
| Lignite ---- do | r 3,047 | 2,999 | 2,900 |
| Total ---- do | r 14,053 | 12,961 | 13,141 |
| Coke, metallurgical ---- do | r 4,469 | 4,467 | 4,333 |
| Fuel briquets, all types ---- do | 162 | 147 | NA |
| Gas: | | | |
| Natural, marketed ---- million cubic feet | r 141 | 114 | e 115 |

See footnotes at end of table.

**Table 1.—Spain: Production of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Gas—Continued | | | | |
| Manufactured: | | | | |
| Gas works | million cubic feet | 25,497 | 25,850 | e 24,700 |
| Coke ovens | do | 61,059 | 62,719 | e 61,700 |
| Blast furnaces | do | 99,340 | 94,601 | e 95,000 |
| Total | | 185,896 | 183,170 | e 181,400 |
| Peat | | 15,839 | 15,000 | e 15,000 |
| Petroleum: | | | | |
| Crude | thousand 42-gallon barrels | 1,020 | 5,932 | 14,334 |
| Refinery products: | | | | |
| Gasoline, motor | do | 32,549 | 38,639 | 38,501 |
| Jet fuel | do | 14,205 | 15,697 | 15,265 |
| Kerosine | do | 1,703 | 1,778 | 1,518 |
| Distillate fuel oil | do | 62,997 | 72,764 | 71,735 |
| Residual fuel oil | do | 113,572 | 133,658 | 144,310 |
| Lubricants, including greased | do | 1,584 | 1,874 | 1,984 |
| Other | do | 38,833 | 41,524 | 41,074 |
| Refinery fuel and losses | do | 10,597 | 15,000 | 17,444 |
| Total | do | 276,040 | 320,934 | 331,831 |

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Data presented includes recorded production of salable acid-grade fluorspar from both fluorspar mines and lead-zinc-fluorspar mines plus an estimate for the production of salable acid-grade fluorspar obtained by beneficiating a portion of total reported salable metallurgical-grade fluorspar output. Total reported production of acid-grade fluorspar was as follows in metric tons: 1972—gross weight 253,870 (calcium fluoride content 246,716); 1973—gross weight 239,824 (calcium fluoride content 233,212); 1974—gross weight 256,537 (calcium fluoride content 248,400). Estimated production of acid-grade fluorspar from beneficiation of metallurgical-grade fluorspar was as follows in metric tons (with quantity of metallurgical-grade fluorspar reported as being processed in this manner given in parenthesis following estimated acid grade output): 1972—gross weight 58,815 (147,037), calcium fluoride content 57,345 (58,815); 1973—gross weight 45,293 (113,233), calcium fluoride content 44,161 (45,293); 1974 (all estimated)—gross weight 64,491 (161,228), calcium fluoride content 62,879 (64,491).

[2] Data presented are the difference resulting from the subtraction of that quantity of metallurgical-grade fluorspar reportedly consumed for the production of acid-grade fluorspar (see footnote 1) from the total reported metallurgical-grade fluorspar output, including that derived from lead-zinc-fluorspar.

## TRADE

Spain's balance-of-trade position deteriorated significantly in 1974 after recovering somewhat in 1973. The mineral trade deficit (excluding chemicals and mineral fuels) rose from $808.2 million in 1973 to $1,373.4 million 1974, a 70% increase. The total commodity trade deficit increased 86% over that of 1973. Values for mineral commodity trade for the last 3 years follow:

| | Value (million dollars) | |
|---|---|---|
| | Mineral commodity trade | Total commodity trade |
| Exports: | | |
| 1972 | 520 | 3,831 |
| 1973 | 774 | 5,257 |
| 1974 | 1,191 | 7,092 |
| Imports: | | |
| 1972 | 2,179 | 6,837 |
| 1973 | 2,555 | 9,752 |
| 1974 | 5,960 | 15,449 |

Source: Estadistica del Comercio Exterior de España (Madrid).

Exports of mineral commodities were valued at $1,191 million, an increase in value of 54% over that of 1973. Increased values of chemicals, tin, and various other mineral exports were greatly exceeded by increased values for imports of iron and steel, copper, and platinum-group metals. Mineral fuels, valued at $481 million, accounted for approximately 40% of Spain's total mineral exports in 1974. Among major mineral groupings, only iron and steel and mercury registered declines in exports.

The value of mineral commodities imported during 1974 increased 133% over that of 1973. The increases were especially large in iron and steel, assorted minerals, copper, aluminum, and platinum-group metals. However, the largest increase was in mineral fuels imports, which rose from $1,266 million in 1973 to $3,920 million in 1974, a 210% increase. Combined with iron and steel, the two accounted for 80% of the total value of mineral imports.

Mineral commodity trade in 1972 and 1973 is given in tables 2 and 3.

## Table 2.—Spain: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite and concentrate | (1) | -- | |
| Oxide and hydroxide | 6 | 38 | United Kingdom 23; Portugal 14; Thailand 1. |
| Metal, including alloys: | | | |
| Scrap | 115 | 68 | France 57; United Kingdom 10. |
| Unwrought | 1,306 | 1,164 | Japan 600; United Kingdom 280. |
| Semimanufactures | 7,269 | 8,967 | Portugal 2,108; United States 1,277; France 616. |
| Antimony metal, including alloys, all forms | 10 | 243 | Netherlands 162; United States 30; France 29. |
| Arsenic: | | | |
| Trioxide, pentoxide, acids | -- | 123 | All to Portugal. |
| Metal, including alloys, all forms | -- | 2 | All to Netherlands. |
| Beryllium metal, including alloys, all forms kilograms | -- | 85 | All to Andorra. |
| Bismuth metal, including alloys, all forms do | -- | 15 | All to Portugal. |
| Cadmium metal, including alloys, all forms | 27 | 33 | United States 14; Netherlands 11; France 4; Belgium-Luxembourg 4. |
| Chromium: | | | |
| Oxide and hydroxide | 23 | 28 | Portugal 14; Colombia 9; Venezuela 2. |
| Metal, including alloys, all forms | 1 | -- | |
| Copper: | | | |
| Ore and concentrate | 178 | 1,324 | All to West Germany. |
| Matte | (1) | -- | |
| Copper sulfate | 1 | (1) | Mainly to Algeria. |
| Metal, including alloys: | | | |
| Scrap | 107 | 1,390 | Mainly to Japan. |
| Unwrought | 3,089 | 9,348 | Netherlands 3,625; West Germany 3,346; France 1,020. |
| Semimanufactures | 3,841 | 4,178 | Romania 835; Israel 566; Portugal 516. |
| Gold metal, worked and partly worked troy ounces | 1,190 | 3,054 | All to Switzerland. |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite thousand tons | 1,896 | 1,661 | West Germany 600; United Kingdom 330; France 323. |
| Roasted pyrite do | 939 | 531 | Mainly to West Germany. |
| Metal: | | | |
| Scrap | 1,107 | 2,832 | Belgium-Luxembourg 1,656; France 283. |
| Sponge iron, powder, shot | 16,012 | 25,881 | Mainly to Portugal. |
| Ferroalloys: | | | |
| Ferromanganese | 15,204 | 29,431 | France 8,708; West Germany 5,114; United States 4,003. |
| Other | 20,623 | 30,724 | West Germany 11,361; United Kingdom 5,438; United States 4,815. |
| Steel, primary forms | 545,331 | 526,986 | Brazil 203,056; Italy 80,317; Belgium-Luxembourg 73,869. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 693,892 | 717,803 | West Germany 147,862; Iran 102,277; U.S.S.R. 68,817. |
| Universals, plates, sheets | 102,133 | 311,484 | West Germany 129,280; Italy 52,393; United States 51,673. |
| Hoop and strip | 8,000 | 11,222 | Italy 3,745; France 2,984; Portugal 1,041. |
| Rails and accessories | r 60 | 5,231 | Mainly to Algeria. |
| Wire | 7,494 | 10,005 | Algeria 2,514; Morocco 2,365; Portugal 1,291. |
| Tubes, pipes, fittings | 105,759 | 129,204 | West Germany 41,213; France 22,967; Romania 8,692. |
| Castings and forgings, rough | 3,287 | 4,848 | United States 1,173; West Germany 861; Canada 818. |
| Lead: | | | |
| Ore and concentrate | 5 | -- | |
| Oxides | 1 | 10 | Mainly to Angola. |
| Metal, including alloys: | | | |
| Scrap | -- | 54 | All to United Kingdom. |
| Unwrought | 286 | 38 | All to France. |
| Semimanufactures | 21 | 1,206 | Mainly to Netherlands. |
| Manganese: | | | |
| Ore and concentrate | 105 | 48 | All to Portugal. |

See footnotes at end of table.

## Table 2.—Spain: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Manganese—Continued | | | |
| Oxides | 1 | -- | |
| Metal | -- | 30 | Netherlands 17; United Kingdom 12. |
| Mercury 76-pound flasks | r 30,981 | 47,660 | United States 7,165; United Kingdom 7,165; Romania 5,889. |
| Molybdenum metal, including alloys, all forms kilograms | 270 | (1) | Mainly to United Kingdom. |
| Nickel metal, including alloys: | | | |
| Scrap | 189 | 85 | France 38; Netherlands 20; United Kingdom 16. |
| Unwrought | 3 | 78 | Netherlands 50; Belgium-Luxembourg 25; Venezuela 2. |
| Semimanufactures | 4 | 27 | Mainly to Italy. |
| Platinum-group metals and silver: | | | |
| Waste and sweepings kilograms | -- | 364 | All to Andorra. |
| Metals, including alloys: | | | |
| Platinum group troy ounces | -- | (1) | Mainly to West Germany. |
| Silver thousand troy ounces | 97 | 1,102 | Switzerland 386; United Kingdom 289; East Germany 225. |
| Selenium, elemental kilograms | 152 | 950 | All to Netherlands. |
| Tantalum metal, including alloys, all forms do | -- | 2 | All to France. |
| Tin: | | | |
| Ore and concentrate long tons | -- | 93 | United Kingdom 48. |
| Metal, including alloys: | | | |
| Scrap do | (1) | (1) | All to Andorra. |
| Unwrought do | 891 | 580 | Netherlands 389; United Kingdom 181; Israel 8. |
| Semimanufactures do | 10 | 4 | Mainly to Israel. |
| Titanium: | | | |
| Ore and concentrate (ilmenite) | 20 | -- | |
| Oxides | 3,949 | 2,347 | Netherlands 1,206; Norway 259; Greece 245. |
| Tungsten: | | | |
| Ore and concentrate | 440 | 439 | United Kingdom 289; West Germany 78; United States 44. |
| Metal, including alloys, all forms | 23 | 1 | Mainly to Netherlands. |
| Vanadium: | | | |
| Oxides | 2 | 2 | All to Netherlands. |
| Metal, including alloys, all forms kilograms | -- | 20 | All to Portugal. |
| Zinc: | | | |
| Ore and concentrate | 4,519 | 6,928 | Mainly to France. |
| Oxide | 732 | 324 | West Germany 205; Greece 60; Netherlands 50. |
| Metal, including alloys: | | | |
| Scrap | -- | 99 | All to West Germany. |
| Blue powder | 1,042 | 19 | All to United States. |
| Unwrought and semimanufactures | 5,909 | 2,292 | Portugal 1,070; Netherlands 463; United States 306. |
| Other: | | | |
| Ore and concentrate of molybdenum, tantalum, titanium, vanadium, zirconium | -- | 34 | Mainly to United States. |
| Ash and residue containing nonferrous metals | 4,123 | 5,160 | West Germany 2,473; Portugal 1,807; Republic of South Africa 298. |
| Oxides, hydroxides, peroxides of metals, n.e.s | r 230 | 320 | Portugal 219; Netherlands 63; France 21. |
| Metals, including alloys, all forms: | | | |
| Alkali, alkaline-earth, rare-earth metals | 117 | 28 | Mainly to Portugal. |
| Pyrophoric alloys | (1) | 1 | Mainly to France. |
| Base metals, including alloys, all forms, n.e.s | 1 | 1 | Mainly to Portugal. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 10,948 | 13,593 | Mainly to United Kingdom. |
| Dust and powder of precious and semiprecious stones (except diamond) value, thousands | $2 | -- | |
| Grinding and polishing wheels and stones | 1,988 | 1,506 | West Germany 610; France 156; United Kingdom 96. |

See footnotes at end of table.

## Table 2.—Spain: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Asbestos | 1 | 1 | Mainly to Portugal. |
| Barite and witherite | 77,303 | 82,105 | West Germany 46,255; Italy 22,500; United Kingdom 9,139. |
| Boron materials, oxide and acid | 1 | 43 | Portugal 23; France 11; Greece 4. |
| Cement ---- thousand tons | 1,230 | 1,279 | Algeria 485; United States 303; British American Territories 93. |
| Chalk | 316 | 10,145 | Mainly to Libya. |
| Clays and clay products, including all refractory brick: | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 10,495 | 16,452 | West Germany 5,692; Netherlands 3,899; France 2,574. |
| Kaolin (china clay) | 55,369 | 62,699 | Italy 22,710; West Germany 20,017; France 11,120. |
| Other | 12,808 | 15,860 | Andorra 5,065; Portugal 4,330; France 2,463. |
| Products: | | | |
| Refractory, including nonclay brick | 7,122 | 6,765 | Mainly to Cuba. |
| Nonrefractory | 133,298 | 148,223 | West Germany 39,138; France 26,060; Andorra 12,203. |
| Diamond, natural and synthetic: | | | |
| Gem, not set or strung value, thousands | $1 | $38 | Mainly to Andorra. |
| Industrial, including powder do | r $27 | $36 | Mainly to Mexico. |
| Diatomite and other infusorial earth | 1,774 | 1,357 | Belgium-Luxembourg 508; United Kingdom 281; West Germany 270. |
| Feldspar, leucite, nepheline, nepheline syenite | 495 | 1,346 | Mainly to United Kingdom. |
| Fertilizer materials: | | | |
| Crude and manufactured: | | | |
| Nitrogenous | 241 | 170 | Andorra 52; Italy 40; Belgium-Luxembourg 40. |
| Phosphatic | 105,844 | 142,234 | Bulgaria 71,207; People's Republic of China 42,303; Italy 10,129. |
| Potassic | 387,554 | 310,383 | Algeria 66,462; Norway 58,452; Portugal 42,215. |
| Other | 1,013 | 24,400 | Mainly to Philippines. |
| Ammonia | 11 | 2,296 | Senegal 1,450; Ivory Coast 837. |
| Fluorspar | 176,797 | 239,705 | Mainly to United States. |
| Graphite, natural | (1) | -- | |
| Gypsum and plasters | 137,919 | 146,044 | Mainly to Sweden. |
| Iodine | (1) | 2 | Mainly to Andorra. |
| Lime | 3,414 | 5,239 | Mainly to Equatorial Guinea. |
| Magnesite | 65,699 | 67,367 | United Kingdom 40,834; West Germany 18,514; Sweden 2,920. |
| Mica, all forms | 125 | 183 | West Germany 47; Italy 45; Turkey 24. |
| Pigments, mineral, including processed iron oxides | 1,871 | 11,009 | United Kingdom 1,783; United States 1,352; Australia 1,085. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural ---- value, thousands | r $1 | $29 | Mainly to Andorra. |
| Manufactured ---- do | $238 | $229 | Mainly to Switzerland. |
| Pyrite (gross weight) - thousand tons | 453 | 308 | Belgium-Luxembourg 169; Denmark 112; United Kingdom 11. |
| Salt and brine ---- do | 17 | 3 | Mainly to United Kingdom and Belgium-Luxembourg. |
| Sodium and potassium compounds, n.e.s | 11,388 | 8,437 | Brazil 2,105; Philippines 1,283; India 800. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous | 14,889 | 16,701 | Mainly to Italy. |
| Slate | 144 | 1,505 | West Germany 948; Andorra 555; Algeria 1. |
| Other | 27,238 | 28,650 | Italy 15,755; France 9,728; West Germany 2,969. |
| Worked: | | | |
| Slate | 55,146 | 64,244 | Mainly to France. |
| Paving and flagstone | 20 | (1) | All to Andorra. |
| Other | 18,072 | 18,444 | Mainly to West Germany. |
| Dolomite | 22,649 | 36,870 | Mainly to United Kingdom. |
| Gravel and crushed rock | 16,300 | 53,234 | Andorra 33,359; Portugal 18,440; United Kingdom 630. |

See footnotes at end of table.

## Table 2.—Spain: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel—Continued | | | |
| Quartz and quartzite | 89,784 | 115,198 | Mainly to Norway. |
| Sand, excluding metal bearing | 35,386 | 49,352 | Mainly to Andorra. |
| Sulfur: | | | |
| Elemental, all forms | 1,377 | 988 | France 480; Egypt 400; Morocco 108. |
| Sulfur dioxide | 3 | 10 | Mainly to Portugal. |
| Sulfuric acid | 9,486 | 3,439 | Morocco 1,800; France 1,634; Equatorial Guinea 3. |
| Talc, steatite, soapstone, pyrophyllite | 65 | 140 | Italy 100; France 20; Dominican Republic 11. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Meerschaum, amber, jet | 38,161 | 47,413 | United Kingdom 16,410; France 12,451; West Germany 10,877. |
| Other | 121,597 | 152,739 | France 108,576; Belgium-Luxembourg 31,210; Japan 7,235. |
| Slag, dross, similar waste, not metal bearing | 62 | 3,994 | Portugal 2,400; France 1,594. |
| Oxides and hydroxides of magnesium, strontium, and barium | 249 | 502 | West Germany 300; United States 127; Republic of South Africa 75. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 31,646 | 29,222 | France 21,805; Cuba 3,274; Algeria 1,143. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 957 | -- | |
| Carbon black and gas carbon | 7,741 | 6,062 | Portugal 3,034; Morocco 1,110; Italy 600. |
| Coal and briquets: | | | |
| Anthracite and bituminous coal | 42,113 | 7,630 | Mainly to Belgium-Luxembourg. |
| Briquets of anthracite and bituminous coal | 2 | -- | |
| Lignite and lignite briquets | 526 | 626 | All to Andorra. |
| Coke and semicoke | 6,569 | 2,195 | Mainly to Portugal. |
| Hydrogen, helium, rare gases | 4 | 6 | Do. |
| Peat, including peat briquets and litter | 200 | 350 | All to Portugal. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | (1) | 103 | All to Italy. |
| Refinery products: | | | |
| Gasoline, including natural do | 8,079 | 7,436 | Netherlands 2,410; United Kingdom 1,362; United States 1,177. |
| Kerosine and jet fuel do | r 1,477 | 407 | United States 120; Libya 71; United Kingdom 64. |
| Distillate fuel oil do | 15,068 | 17,259 | United States 3,809; West Germany 2,394; Bunkers 1,013. |
| Residual fuel oil do | 11,543 | 12,293 | United States 5,568; Bunkers 3,447; Italy 1,245. |
| Lubricants do | r 138 | 104 | Mainly to Italy. |
| Other: | | | |
| Liquefied petroleum gas do | r 534 | 237 | Mainly to France. |
| Mineral jelly and wax do | 14 | 7 | Mainly to United Kingdom. |
| Bitumen and other residues do | 230 | 427 | Algeria 201; Portugal 98; Zaire 47. |
| Bituminous mixtures, n.e.s. do | 149 | 127 | Equatorial Africa Customs Union 58; Nigeria 27; Zaire 20. |
| Pitch and pitch coke do | 29 | 42 | Mainly to France. |
| Unspecified do | 17 | 83 | Mainly to United Kingdom. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 17,973 | 15,991 | Mainly to Netherlands. |

r Revised.
1 Less than ½ unit.

## Table 3.—Spain: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 100,937 | 108,839 | Greece 49,009; Guyana 37,902; Surinam 11,238. |
| Oxide and hydroxide | 304,301 | 326,770 | France 139,747; Guinea 119,935; Jamaica 50,835. |
| Metal, including alloys: | | | |
| Scrap | 3,738 | 3,453 | Canada 1,161; Portugal 325; France 270. |
| Unwrought | 30,924 | 25,541 | United Kingdom 7,894; Norway 6,641; Netherlands 3,116. |
| Semimanufactures | 7,906 | 9,123 | Belgium-Luxembourg 2,076; West Germany 1,388; Sweden 1,049. |
| Antimony: | | | |
| Ore and concentrate | 550 | 306 | Mainly from Morocco. |
| Metal, including alloys, all forms | 296 | 367 | Belgium-Luxembourg 112; People's Republic of China 88; Czechoslovakia 84. |
| Arsenic: | | | |
| Natural sulfides | 500 | -- | |
| Trioxide, pentoxide, acids | 569 | 547 | Mainly from France. |
| Metal, including alloys, all forms | 12 | 16 | Mainly from Sweden. |
| Beryllium metal, including alloys, all forms kilograms | 11 | 5 | Mainly from United States. |
| Bismuth metal, including alloys, all forms | 93 | 103 | West Germany 51; United Kingdom 11; Mexico 10. |
| Cadmium metal, including alloys, all forms | 1 | 1 | Mainly from United Kingdom. |
| Chromium: | | | |
| Chromite | 54,837 | 89,690 | Republic of South Africa 33,364; Turkey 25,315; U.S.S.R. 13,601. |
| Oxide and hydroxide | 454 | 357 | Poland 138; Bulgaria 106; West Germany 67. |
| Metal, including alloys, all forms | 27 | 17 | Mainly from United Kingdom. |
| Cobalt oxide and hydroxide | 97 | 148 | Belgium-Luxembourg 62; Canada 53; France 30. |
| Copper: | | | |
| Ore and concentrate | 144,948 | 115,457 | Australia 40,994; Ireland 38,124; Mauritania 11,019. |
| Matte | 24,529 | 14,408 | Israel 7,170; Chile 5,246; United Kingdom 1,327. |
| Copper sulfate | r 619 | 908 | Bulgaria 589; Belgium-Luxembourg 114; Yugoslavia 100. |
| Metal, including alloys: | | | |
| Scrap | 16,763 | 18,419 | France 4,203; West Germany 2,901; United States 2,415. |
| Unwrought | 35,779 | 50,578 | Belgium-Luxembourg 9,997; Zambia 8,673; Chile 7,792. |
| Semimanufactures | 14,018 | 16,871 | United Kingdom 2,989; West Germany 2,674; Italy 2,331. |
| Gold: | | | |
| Ore and concentrate | 2 | -- | |
| Waste and sweepings kilograms | 500 | 509 | All to West Germany. |
| Metal, unworked or partly worked thousand troy ounces | 836 | 804 | United Kingdom 418; Switzerland 354; West Germany 29. |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite thousand tons | 4,147 | 5,116 | Brazil 1,209; Sweden 877; Mauritania 732. |
| Roasted pyrite | 341 | -- | |
| Metal: | | | |
| Scrap thousand tons | 1,825 | 2,012 | United States 898; United Kingdom 347; U.S.S.R. 186. |
| Pig iron, including cast iron do | 34 | 43 | Canada 21; Finland 10; West Germany 8. |
| Sponge iron, powder, shot do | 7 | 8 | Sweden 5; France 2; West Germany 1. |
| Ferroalloys do | 21 | 26 | France 5; West Germany 2; Finland 2. |
| Steel, primary forms do | 353 | 377 | Netherlands 215; United Kingdom 37; Japan 23. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections do | 139 | 173 | West Germany 37; France 21; Brazil 19. |

See footnotes at end of table.

## Table 3.—Spain: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Metal—Continued | | | |
| Semimanufactures—Continued | | | |
| Universals, plates, sheets _ thousand tons | 529 | 403 | West Germany 110; United Kingdom 86; France 67. |
| Hoop and strip _ do | 53 | 74 | France 26; West Germany 16; Czechoslovakia 8. |
| Rails and accessories do | 1 | 3 | France 1; United Kingdom 1; West Germany 1. |
| Wire do | 13 | 15 | West Germany 5; Belgium-Luxembourg 4; France 3. |
| Tubes, pipes, fittings do | 46 | 47 | West Germany 14; France 9; Italy 7. |
| Castings and forgings, rough | 695 | 1,178 | Italy 465; West Germany 262; France 207. |
| Lead: | | | |
| Ore and concentrate | 24,728 | 33,012 | Mainly from Morocco. |
| Oxides | 3 | 452 | Mainly from United Kingdom. |
| Metal, including alloys: | | | |
| Scrap | 127 | 984 | Mainly from United States. |
| Unwrought | 3,511 | 6,344 | West Germany 2,901; United Kingdom 2,097; East Germany 670. |
| Semimanufactures | 175 | 140 | West Germany 54; Belgium-Luxembourg 28; Denmark 20. |
| Magnesium metal, including alloys, all forms | 558 | 953 | United States 582; Norway 322; France 23. |
| Manganese: | | | |
| Ore and concentrate | 259,677 | 331,098 | Republic of South Africa 124,378; Ghana 58,830; Equatorial Africa Customs Union 52,386. |
| Oxides | 1,582 | 1,954 | Japan 1,089; Taiwan 300; People's Republic of China 250. |
| Metal | 456 | 694 | Japan 310; United States 212; France 145. |
| Mercury 76-pound flasks | 5 | 15 | Austria 9; West Germany 3; Mexico 1. |
| Molybdenum metal, including alloys, all forms | r 46 | 30 | United States 8; United Kingdom 8; Austria 5. |
| Nickel: | | | |
| Ore and concentrate | 101 | 10 | All from Belgium-Luxembourg. |
| Matte, speiss, similar materials | 312 | 468 | Finland 216; Canada 154; Republic of South Africa 40. |
| Metal, including alloys: | | | |
| Scrap | 167 | 116 | Mainly from France. |
| Unwrought | 3,789 | 4,853 | Cuba 1,334; Canada 1,299; United Kingdom 804. |
| Semimanufactures | r 1,812 | 2,037 | France 1,027; United Kingdom 277; West Germany 272. |
| Platinum-group metals and silver: | | | |
| Ore and concentrate | 89 | -- | |
| Waste and sweepings | 431 | 644 | Mainly from United States. |
| Metal, including alloys: | | | |
| Platinum group troy ounces | (1) | (1) | Mainly from Brazil. |
| Silver thousand troy ounces | r 8,906 | 11,413 | United States 3,002; Belgium-Luxembourg 1,190; United Kingdom 1,093. |
| Rare-earth metals: | | | |
| Oxides | 110 | 160 | France 95; United Kingdom 54; United States 6. |
| Metals, including alloys | 13 | 21 | France 13; Brazil 7. |
| Selenium, elemental | 11 | 20 | Japan 8; United States 4; Canada 4. |
| Silicon, elemental | 2,419 | 440 | Mainly from Yugoslavia. |
| Tellurium, elemental | 9 | 10 | United Kingdom 5; Peru 4; U.S.S.R. 1. |
| Tin: | | | |
| Ore and concentrate _ long tons | 5,009 | 5,266 | Zaire 2,840; Bolivia 537; Australia 419. |
| Oxides do | r 74 | 115 | United Kingdom 78; West Germany 34; Italy 1. |
| Metal, including alloys do | 120 | 122 | United Kingdom 71; West Germany 31; Belguim-Luxembourg 6. |
| Titanium: | | | |
| Ore and concentrate | 39,468 | 43,766 | Mainly from Norway. |
| Oxides | 7,841 | 7,205 | West Germany 2,321; France 1,745; Italy 1,370. |

See footnotes at end of table.

## Table 3.—Spain: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Tungsten: | | | |
| Ore and concentrate | 208 | 348 | Bolivia 197; Rwanda and Burundi 73; Burma 55. |
| Metal, including alloys, all forms | 20 | 22 | United Kingdom 6; Austria 5; West Germany 2. |
| Uranium and thorium: | | | |
| Ore and concentrate (uranium) kilograms | 56 | 434 | All from United States. |
| Oxides | 2 | 2 | Mainly from France and United Kingdom. |
| Metal, including alloys, all forms kilograms | 151 | 561 | Mainly from Italy. |
| Vanadium: | | | |
| Pentoxide do | 400 | 19 | United Kingdom 10; West Germany 9. |
| Metal, including alloys, all forms | -- | 10 | Mainly from United States. |
| Zinc: | | | |
| Ore and concentrate | 48,121 | 55,830 | Canada 24,452; Peru 13,249; Sweden 6,542. |
| Oxide and peroxide | 375 | 906 | West Germany 503; France 133; Netherlands 89. |
| Metal, including alloys, all forms | 3,959 | 3,560 | France 1,083; Republic of Korea 761; U.S.S.R. 756. |
| Zirconium metal, including alloys, all forms | 1 | 3 | Mainly from France. |
| Other: | | | |
| Ore and concentrate: | | | |
| Of molybdenum, tantalum, titanium, vanadium, zirconium | 5,491 | 15,987 | Mainly from Australia |
| Of base metals, n.e.s | 14,165 | 272 | Do. |
| Ash and residue containing nonferrous metals | 44,226 | 131,682 | Mainly from Peru. |
| Oxides, hydroxides, peroxides of metals | 1,364 | 1,518 | West Germany 389; France 336; Norway 211. |
| Metals, including alloys, all forms: | | | |
| Alkali and alkaline earth | r 491 | 72 | Mainly from West Germany. |
| Pyrophoric alloys | 10 | 10 | West Germany 4; France 1; United Kingdom 1. |
| Base metals, including alloys, all forms, n.e.s | 266 | 403 | Belgium-Luxembourg 115; United States 85; France 62. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 2,512 | 809 | United States 273; Italy 194; France 161 |
| Dust and powder of precious and semiprecious stones (except diamond) value, thousands | $61 | $49 | United States $21; France $14; United Kingdom $10. |
| Grinding and polishing wheels and stones | 921 | 1,339 | West Germany 283; Italy 236; United Kingdom 228. |
| Asbestos | 82,608 | 109,045 | Republic of South Africa 50,697; Canada 44,759; Italy 6,665. |
| Barite and witherite | 1,111 | 1,012 | Mainly from France. |
| Boron materials: | | | |
| Crude natural borates | 32,524 | 58,139 | Mainly from United States. |
| Oxide and acid | 855 | 2,739 | Mainly from Turkey. |
| Bromine | (1) | 20 | Mainly from Israel. |
| Cement | 144,828 | 375,388 | United Kingdom 88,428; Romania 83,032; Lebanon 75,955. |
| Chalk | 7,476 | 6,907 | France 4,793; Belgium-Luxembourg 790; West Germany 785. |
| Clays and clay products, including all refractory brick: | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 36,007 | 36,227 | Italy 18,078; Morocco 11,398; United States 3,239. |
| Kaolin (china clay) | 92,468 | 106,690 | Mainly from United Kingdom. |
| Other | 51,183 | 57,160 | United Kingdom 29,694; France 12,057; United States 6,901. |
| Products: | | | |
| Refractory, including nonclay brick | 27,441 | 31,577 | West Germany 8,940; France 8,307; Austria 5,998. |

See footnotes at end of table.

## Table 3.—Spain: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Clays and clay products—Continued | | | |
| Products—Continued | | | |
| Nonrefractory | 16,040 | 32,433 | Italy 18,528; Portugal 5,473; West Germany 4,227. |
| Cryolite and chiolite | 1,250 | 1,520 | All from Denmark. |
| Diamond: | | | |
| Natural and synthetic: | | | |
| Gem, not set or strung value, thousands | r $7,979 | $6,203 | Mainly from Belgium-Luxembourg. |
| Industrial, including powder ---------- do | $1,479 | $5,454 | France $2,611; Belgium-Luxembourg $1,361; Republic of South Africa $598. |
| Total ---------- do | r $9,458 | $11,657 | |
| Manufactured, industrial -- do | $35 | $4 | Mainly from United Kingdom. |
| Diatomite and other infusorial earth | 2,562 | 3,017 | Uinted States 1,525; France 1,060; West Germany 312. |
| Feldspar, leucite, nepheline, nepheline syenite | 9,433 | 14,390 | France 8,476; Republic of South Africa 2,993; Norway 1,560. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 49,414 | 40,617 | Mainly from Chile. |
| Phosphatic -- thousand tons | 1,999 | 1,941 | Mainly from Morocco. |
| Potassic | 5 | 1 | Mainly from France. |
| Manufactured: | | | |
| Nitrogenous | 235,607 | 230,903 | France 66,878; West Germany 50,142; Norway 49,141. |
| Phosphatic | 64,191 | 42,800 | Belgium-Luxembourg 15,360; France 14,694; Tunisia 5,509. |
| Potassic | 1,525 | 15,843 | Israel 5,670; West Germany 5,470; United States 4,684. |
| Other, including mixed | 61,393 | 27,013 | Romania 10,646; Belgium-Luxembourg 9,313; West Germany 2,976. |
| Fluorspar | 208 | 24 | Republic of South Africa 16; Netherlands 7. |
| Graphite natural | 1,114 | 1,430 | West Germany 489; Malagasy Republic 318; Austria 209. |
| Gypsum and plasters | 921 | 1,381 | Morocco 777; United Kingdom 325; United States 129. |
| Iodine | 58 | 53 | Mainly from Japan. |
| Lime | 124 | 206 | Morocco 111; France 77; Portugal 12. |
| Magnesite | 36,328 | 37,065 | Greece 17,123; Austria 5,187; Brazil 4,538. |
| Mica, all forms | 1,346 | 1,543 | India 391; United Kingdom 301; Norway 284. |
| Pigments, mineral, including processed iron oxides | 3,792 | 4,164 | West Germany 2,765; France 753; United Kingdom 140. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural: | | | |
| Gem ------ value, thousands | r $2,466 | $6,042 | Belgium-Luxembourg $2,542; West Germany $979; India $879. |
| Industrial ---------- do | $84 | $819 | West Germany $495; Belgium-Luxembourg $256; Thailand $29. |
| Manufactured ---------- do | $603 | $561 | Mainly from Switzerland. |
| Pyrite (gross weight) | 91 | 169 | Italy 79; United States 69; West Germany 20. |
| Salt and brine | 101,986 | 52,484 | Tunisia 32,530; Algeria 14,127; France 2,843. |
| Sodium and potassium compounds, n.e.s | 45,297 | 32,717 | Mainly from France. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous | 44,227 | 63,399 | Italy 32,213; Portugal 27,580; France 1,034. |
| Slate | 34 | 90 | West Germany 57; Netherlands 25; Andorra 8. |
| Other | 13,705 | 18,475 | Norway 6,549; Republic of South Africa 3,437; Sweden 2,627. |
| Worked: | | | |
| Slate | 647 | 603 | Mainly from Italy. |
| Paving and flagstone | 58 | 13 | All from Belgium-Luxembourg. |

See footnotes at end of table.

## Table 3.—Spain: Imports of mineral commodities—Continued

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel—Continued | | | |
| Dimension stone—Continued | | | |
| Worked—Continued | | | |
| Other | 1,965 | 1,449 | Italy 828; Portugal 361; Norway 121. |
| Dolomite, chiefly refractory grade | 2,353 | 2,300 | Norway 1,488; France 781; West Germany 15. |
| Gravel and crushed rock | 51,218 | 47,626 | Mainly from Morocco. |
| Quartz and quartzite | 1,172 | 1,467 | Sweden 855; Belgium-Luxembourg 309; West Germany 168. |
| Sand, excluding metal bearing | 90,230 | 290,895 | Morocco 168,643; Portugal 79,500; Belgium-Luxembourg 29,423. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 94,361 | 93,411 | France 67,408; Poland 21,035; United States 2,757. |
| Colloidal | 699 | 400 | Mainly from West Germany. |
| Sulfur dioxide | 40 | 26 | Mainly from Netherlands. |
| Sulfuric acid | 304,177 | 156,093 | West Germany 71,593; Poland 41,817; Portugal 9,579. |
| Talc, steatite, soapstone, pyrophyllite | 6,000 | 8,376 | France 4,252; Norway 1,888; Pakistan 697. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Meerschaum, amber, jet | 90 | -- | |
| Other | 58,493 | 55,100 | Italy 12,703; Greece 12,343; U.S.S.R. 9,607. |
| Slag, dross, similar waste, not metal bearing | 598 | 1,169 | France 763; West Germany 362; Sweden 25 |
| Oxides and hydroxides of magnesium, strontium, barium | 3,009 | 6,446 | Mainly from Italy. |
| Fluorine | -- | 20 | Mainly from France. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 1,157 | 2,217 | France 720; Belgium-Luxembourg 521. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 543 | 1,230 | United States 761; United Kingdom 444; Mexico 20. |
| Carbon black and gas carbon | 17,162 | 18,899 | France 9,922; Netherlands 3,130; United States 2,146. |
| Coal and briquets: | | | |
| Anthracite and bituminous coal thousand tons | 2,941 | 3,056 | United States 1,724; Poland 1,193; Australia 75. |
| Briquets of anthracite and bituminous coal | 30 | 22 | France 15; United Kingdom 7. |
| Lignite and lignite briquets | 21,431 | 25,280 | Mainly from France. |
| Coke and semicoke | 339,636 | 419,938 | West Germany 191,353; United States 89,903; Italy 63,583. |
| Gas, natural liquefied thousand cubic feet | 45,368 | 63,146 | All from Libya. |
| Hydrogen, helium, rare gases | 585 | 1,260 | Belgium 1,028; United Kingdom 123; France 76. |
| Peat, including peat briquets and litter | 3,742 | 4,654 | Sweden 994; Finland 960; Poland 664. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | r 286,397 | 305,260 | Saudi Arabia 144,095; Iran 39,047; Algeria 33,097. |
| Refinery products: | | | |
| Gasoline, including natural do | 1,430 | 857 | Surinam 253; Algeria 233; France 144. |
| Kerosine do | r (1) | (1) | All from United States. |
| Distillate fuel oil do | 664 | 185 | Netherlands 74; United States 45; U.S.S.R. 41. |
| Residual fuel oil do | 1,691 | 2,911 | Italy 1,754; Trinidad and Tobago 305; France 296 |
| Lubricants do | r 370 | 523 | Netherlands 149; United States 135; Portugal 93. |
| Other: | | | |
| Liquefied petroleum gas do | r 3,233 | 3,669 | France 2,442; Netherlands 692; Italy 239. |
| White spirit do | 32 | 13 | France 6; United States 6; Belgium-Luxembourg 1. |

See footnotes at end of table.

Table 3.—Spain: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum—Continued | | | |
| Refinery products—Continued | | | |
| Other—Continued | | | |
| Mineral jelly and wax thousand 42-gallon barrels | r 151 | 185 | France 43; Belgium-Luxembourg 24; Netherlands 23. |
| Bitumen and other residues do | 268 | 173 | Mainly from Surinam. |
| Bituminous mixtures, n.e.s do | 20 | 3 | Mainly from United Kingdom. |
| Pitch, pitch coke, petroleum coke do | 1,402 | 1,272 | United Kingdom 922; West Germany 289; U.S.S.R. 40. |
| Unspecified do | 547 | 336 | U.S.S.R. 110; Netherlands 91; Belgium-Luxembourg 56. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons | 144 | 132 | United States 100; Netherlands 17; Belgium-Luxembourg 7. |

r Revised.
1 Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Primary aluminum production in Spain totaled 188,795 tons in 1974. Between 1964 and 1974, primary aluminum production rose 280% as a result of large investments and research. Typical of the modernization and improvement that had been carried out was the plan by Empresa Nacional de Aluminio, S.A. (ENDASA), to install a computer control system for its smelting operations. ENDASA had contracted with Alcan Smelter Services and Alcan Aluminum, Ltd., of Canada, to carry out the installation. ENDASA also was to supply Echevarría Hermanos, S.A., of Vitoria with unwrought aluminum for 18,000 tons of electrical cable to be exported to Yugoslavia. The issuing of export licenses for unwrought aluminum previously had been temporarily suspended, in early 1971 and late 1973. The suspension was lifted each time.

In January 1974, Aluminio de Galicia, S.A. (ALUGASA), expanded its capacity by bringing 18 additional aluminum cells into operation at its La Coruña smelter. This raised total capacity to 70,000 tons per year. As of January, this expansion plus ALUGASA's Sabiñánigo facility, brought the company's total capacity up to 84,000 tons per year of primary aluminum.

The location for the Villagarcía de Arosa alumina-aluminum complex was uncertain at yearend. The project called for the production of 800,000 tons per year of alumina and 175,000 tons per year of aluminum in several stages. The project was originally planned for a location near Pontevedra on Spain's Atlantic coast, but strong opposition from groups fearing pollution damage to the coastal areas forced relocation of the site. The new site being considered was in Luago Province of Galicia. The delay and change of location would increase the total investment substantially from the original $443 million.

Instituto Nacional de Industria (INI), the Spanish state-holding company, held 5% of the capital of Cia. Exploradora de Bauxita (Trombetas). The latter planned to supply the alumina and aluminum complex at Villagarcía de Arosa with bauxite from the Trombetas River deposit in northern Brazil.

**Copper.**—Andaluza de Piritas, S.A., studied the feasibility of recovering about 52 million tons of pyrite from deposits that were evaluated over the previous 4 years at Aznalcóllar, Seville. To extract the mineral content, an open pit greater than 2 kilometers in diameter would be required to remove about 15 million tons of overburden. The project would be carried out in three phases. The first phase would yield 40,000 tons per day of pyrites, which would be processed by flotation. The output would represent about 50% of the copper and zinc concentrates and 30% of the lead currently produced in

Spain by this process. The second phase would encompass the extraction of the iron and sulfur contained in the pyrites after the flotation processing. This would require the construction of secondary chemical processing plants. The third phase involves the transformation of the copper, lead, and zinc concentrates into finished metals, which would require a large complex of facilities. Initial excavation, earth movement, and basic structures would require 3 years to complete and would employ about 1,500 workmen; the required labor force would decrease to about 500 for the actual mining and processing. The project was being planned in collaboration with the West German firm of Metalgesellschaft, A.G.

**Iron Ore.**—Several mining companies reported to the Ministries for Industry and Public Transport that the iron ore mining industry was beset by excessively high rail costs in 1974. In some cases, inland rail freight tariffs were as much as 60% of the cost of the ore, which made it difficult to compete with imported ores of higher iron content that are not subject to such high transport premiums.

Agrupacion Minera S.A. (AGRUMINSA), the mining subsidiary of Altos Hornos de Vizcaya, S.A. (AHV), conducted prospecting operations with the Instituto Geologico y Minero in the provinces of Vizcaya (the Abanto and Ciérvana regions), Guadalajara (El Pobe), and Granada (Marquesado). AGRUMINSA planned to expand sinter capacity with a new 2-million-ton-per-year plant to be built at Sestao. Carbonate iron ore from deposits in Gallarta and Bodovalle would be used.

A joint Spanish and Brazilian company was established in Brasilia, Brazil, to exploit iron ore and manufacture pellets for the Spanish iron and steel industry. The Brazilian firm Companhia Vale do Rio Doce (CVRD) was to have a 51% interest in this first joint iron ore agreement. A capacity of 3 million tons per year of ore was expected. INI committed itself to consuming a minimum of 1.8 million tons of this total. Spain also was to exploit iron ore deposits in Guinea. The project was to be called Mifergui-Nimba.

**Iron and Steel.**—The generally favorable situation of the steel industry in 1973 was tempered somewhat in 1974 by the rising cost of labor and raw materials, and the heavy dependence on imports of coking coal, iron ore, and scrap. Spanish demand for scrap greatly exceeded supply throughout 1974. About 1.3 million tons was needed to fulfill demand. However, expansions continued, and a new National Iron and Steel Plan was established for 1974 to 1982. It was predicted that Spain's steel consumption would be 11.4 million tons in 1974, and would gradually increase to 20 million tons in 1982. During the first 10 months of 1974, Spanish steel consumption was 9.5 million tons, a 5.5% increase over that of the same period of 1973. More than 80% of this amount was common steel; the remainder was specialty steels. By 1985, Spain planned to double its steel-producing capacity. A target of 12 million tons was set for 1975. The previous national program resulted in quadrupling production in 8 years.

The new program basically continued the one established in 1964 and permitted smaller, nonintegrated firms to work together to increase their production efficiency. Nonintegrated firms may also receive special benefits for volunteering to act in concert with the Government. One such expansion program, which included a specialty steel mill, was planned for the Reinosa works of Astilleros Españolas S.A., an INI subsidiary. In addition, projects were approved for Campo de Gibraltar and the industrial area of Galicia. For Galicia in particular, a nonintegrated, nonspecialty steel plant was planned. Direct reduction expansion was also high on the list of priorities and, rather than being concerned only with increasing domestic production, the new program was more internationally oriented.

Unión de Siderúrgicas Asturianas, S.A. (UNINSA), located at Gijón-Veriña, and Empresa Nacional Siderúrgica, S.A. (ENSIDESA), at Avilés, were to have merged by yearend. The two firms were expected to boost their combined steel output to 7 million tons by 1977. INI would hold about 90% control of the new company, which would adopt the name of ENSIDESA. After the merger, the company would employ 25,000 and would be the largest industrial concern in Spain by volume of sales. ENSIDESA was also considering expanding its Veriña plant at the beginning of 1974; plans included constructing two new blast furnaces,

a sinter plant, a steel shop, and extensions to existing coke-oven batteries.

AHV bought the Spanish reroller Laminaciones de Lesaca in early 1974. The purchase improved AHV's cold-rolling and galvanizing capability, and marketing channels were extended by Lesaca's distribution warehouses in 18 Spanish towns. Moreover, Lesaca's product range was considerable, and included small-diameter welded tubes, structural tubes, sections, cold-rolled sheet, and hot-rolled and galvanized sheet.

In other developments of AHV, the No. 2A blast furnace at the Sestao works was reconstructed and relit at the beginning of the year. Capacity was reported as 1.9 million tons per year of steel, 87% of which was produced by the basic oxygen process.

Work continued on the major project at Sagunto near Valencia during the year. The construction, performed by Altos Hornos de Mediterraneo (AHM), was not expected to be completed until 1980.

A direct-reduction plant was to be built on the Biscay coast by a consortium of Spanish companies. Construction was expected to take 2 years, and the plant was to consume natural gas. Banco de Credito Industrial would provide 40% of the necessary funds. Tecomet S.A. of Bilbao reportedly opened negotiations for the construction of direct-reduction installations for Siderúrgica de Gibraltar, S.A., and two other projects.

**Lead and Zinc.**—Asturiana de Zinc, S.A., planned to construct a sulfuric acid plant at San Juan de Nieva (Asturias). The West German firm Lurgi Chemie & Hüttentechnik Gmbh (Frankfurt) was commissioned to design and construct the facility, which was to use the Lurgi process. The new operation would assist in increasing zinc production of the company from 85,000 tons per year to between 110,000 and 120,000 tons per year by 1975.

In other developments, STA Minero Metalurgica Peñarroya España, S.A., of Madrid signed an agreement with the French firm Tecminement of Paris for a turnkey technical operation. The French company was to install a wet dechlorination apparatus at Peñarroya's lead and silver refinery furnaces at Cartagena. A group of Spanish companies planned to build a 35,000- to 40,000-ton-per-year lead smelter at Linares, Jaén. The unit would treat sulfide residues from the Huelva-Sevilla region, as well as local ores. The smelter would cost $8.7 million, and replace the 17,000-ton-per-year La Cruz smelter.

The planned mining operation for Aznalcóllar, Seville, described under the "Copper" section would also produce quantities of lead and zinc.

**Mercury.**—The Spanish Minister of Industry established a provisional reserve in favor of the state for all minerals within a 25-kilometer radius of the Almadén mine. This comprised parts of the provinces of Ciudad Real, Córdoba, and Badojoz, and was to avoid any interference with exploration of Minas de Almadén. The study of the treatment of tailings at the Almadén mine by Soviet technicians materialized into a $6.1 million contract with Machinoexport of the U.S.S.R. for extracting quicksilver from low-grade ore.

The first International Mercury Congress was held in Barcelona on May 6–13, and was attended by representatives from 27 nations. At the meeting, Antonio Berrera de Irimo, the Spanish Minister of Finance, suggested establishing a permanent organization to encourage cooperation between the mercury consuming and producing countries. He stated that prices must be stabilized for the good of producer and consumer, and that the beneficial uses of mercury must be stressed. Papers were presented at the meeting on history-economics, geology, extractive metallurgy, analysis, contamination, biological effects, and applications of mercury.

**Tin.**—Mettalurgia del Noroeste, S.A. (MENSA), contracted with the Bolivian Mining Corporation (COMIBOL) to buy 1,200 tons per year of high-grade tin concentrate as part of a Bolivian minerals marketing policy of promoting sales outside traditional markets. COMIBOL's yearly capacity was expected to increase to about 7,000 tons per year of tin by July. It was reported that private Bolivian concerns were also expected to sell large amounts of high-grade tin concentrate to Spain during the year and that MENSA was considering buying low-grade concentrates.

**Titanium and Tungsten.**—Spain was rejected as a location for a $TiO_2$ plant by E. I. du Pont de Nemours & Co. of the United States. The rejection was partly

the result of a proposal by Titanio, S.A., to build a 30,000-ton-per-year $TiO_2$ plant utilizing the sulfate route at Huelva on the south coast; Titanio planned to increase production to 100,000 tons per year by 1978. Pollution problems at other $TiO_2$ plants along the Mediterranean reportedly severely disrupted operations, a factor which undoubtedly contributed to du Pont's decision.

Spain reportedly consumed between 150 and 200 tons of tungsten in 1974. Ferroaleaciones Españolas, S.A., supplied nearly all of the material for a few imports.

## NONMETALS

**Chlorine.**—Energia e Industrias Aragonesas, S.A. (EIASA), concluded a contract with Oronzio de Nora-Impianti Elettrochimi S.A. of Italy. Under terms of the contract, the Italian firm would supply de Nora mercury cells to EIASA's Huelva plant, boosting its chlorine capacity by 110 tons per day. When fully operational in mid-1975, the new unit should increase Huelva's capacity to 230 tons per day of chlorine.

**Fertilizer Materials.**—*Phosphates.*—Capacity of the phosphate mine of Fosfatos de BuCraa, S.A., in the Spanish Sahara was reported as 3 million tons in 1974. This was to be increased to 6 million tons annually in 1975, with reserves estimated as 1,700 million tons of phosphate rock. Production for 1975 was projected at 4 million tons. About 50% of that amount was produced in 1974. For 1976, production was to be increased to 5 or 6 million tons. A decision on whether to expand to 10 million tons per year would be made at that time.

The $P_2O_5$ content of the ores at Bu Craa is between 30% and 40%, and thickness of the phosphate layer varies from 2.5 to 7 meters. Most of the 75% and 80% bone-phosphate-of-lime concentrate was shipped to Spain; the remainder went to Japan, the United States (28,000 metric tons), and Uruguay. Strip mining was used to remove the mineral, and a primary crushing plant was used to remove silex and limestone waste. Other facilities included a 100-kilometer conveyor to carry the ore to the coast, and a concentration plant and port facility. Most of the equipment was supplied by U.S. companies. No facilities existed in the Spanish Sahara for processing concentrated phosphate into fertilizers or phosphoric acid.

**Sand and Gravel.**—*Silica.*—The only silica exports went to the Pyrenean State of Andorra. Silica was imported by Spain in 1974 from Belgium, the Netherlands, France, and West Germany, but the total amount was relatively small.

Largest of the Spanish silica-sand producers was Arenas de Arija, S.A., which reportedly produced over 250,000 tons of silica sand from two operations in Burgos Province—at Arija and Cabanas de Vintus. Second in size was Industrias de Cuarzo, S.A., which extracted sand from operations at Ribadesella in Oviedo Province and Burgillo in Segovia Province. Nearly all of its approximately 200,000-ton-per-year output was consumed by its parent company. Sand was produced as a coproduct of kaolin mining by both Caolines del Norte, S.A., and Caosil, the third and fourth largest producers, respectively. Caolines del Norte, S.A., produced about 50,000 tons of silica sand from two operations, at Hontoria del Pinar (Burgos Province) and Soria (Soria Province). Caosil produced somewhat less from its operation at Villanvera de Algora (Guadalajara). One of the principal end products of sand is glass. The major manufacturer of glass in Spain was Cristaleria Española, which produced flat glass and other glass products at six main works in Spain.

## MINERAL FUELS

**Petroleum and Natural Gas.**— Spain relied on imports from Arab countries for over 75% of its requirements of crude oil during the year. Spanish officials held several meetings with Arab representatives regarding petroleum supply. In particular, negotiations took place with Saudi Arabia and Iraq. Spain agreed with Iraq to supply industrial and agricultural machinery, as well as to execute various industrial and agricultural projects, in exchange for the insured supply of 28 million tons of crude petroleum over a 5-year period. By this agreement, Iraq was to supply about 15% of the total of crude oil imports. Despite its close cooperation with the Arabian countries, Spain paid world market prices for its imported oil, which were reflected in high domestic prices for petroleum products. In March, the prices of a wide range of petroleum products increased substantially. Gasoline was raised 17.5% and diesel

fuel, depending on its end use, was raised as much as 242%. Fuel oil for heating rose 48%; for industrial use, the price increase was 94%. Compañiá Arrendataria del Monopolia Petróleos, S.A. (CAMPSA), was reportedly subsidized by the Spanish Government with $500 million in order to keep prices at these levels during 1975. Because of the price hikes, power rates were to be raised about 15% in April 1975. To deal with the energy situation, a series of measures from exploration to expansion of power facilities were to be implemented by the Spanish Government. Energy-saving measures were also taken, such as setting lower highway speed limits and adjusting clocks 1 hour ahead of solar time.

A draft law on hydrocarbons was also debated in the Spanish legislature. Included in the bill were new jurisdiction claims on the Continental Shelf and a depletion allowance for prospecting companies. Total investment of the Spanish oil industry to the beginning of the year was $2.5 billion, divided as follows: domestic exploration and production, 15%; foreign exploration and production, 15%; sea transport of crude oil, 21%; refining, 31%; and distribution, 28%.

Three Spanish oil companies merged into a single company, to be known as the Empresa Nacional de Petróleos (ENPETROL). These companies were Refinería de Petróleos de Escombreras, S.A. (REPESA); Empresa Nacional de Petróleos de Tarragona, S.A. (ENTASA); and Empresa Nacional "CALVO SOTELO" de Combustibles Liquidos y Lubricantes, S.A. (ENCASO). The new company's refining capacity for the national market will be 14 million tons for 1974, with a planned increase to 26 million tons in the following 5 years. ENPETROL was to assume responsibility for 24% of Spain's energy supplies in 1980.

Under Decree No. 2232, dated July 20, 1974, Spain issued a plan calling for an increase in petroleum refining capacity to 86 million tons per year by 1980, from the 1974 capacity of 50 million tons per year. About 73 million tons of the projected amount would be for domestic consumption, and the remainder would be for export. Eight of Spain's nine refineries were to be expanded, and one new refinery was to be constructed in central Spain. The expansion included REPESA's Cartagena refinery, the Algericas and Tenerife refineries of Compañia Española de Petróleos (CEPSA); and the Bilbao refinery of Refinería de Petróleos del Norte, S.A. (PETRONOR).

Although the offshore Amposta Field provided less than 5% of Spain's oil requirements, record production rates were reported during the year. Production could have gone higher, but was limited to about 1.5 million tons in order to make reserves last longer.

A new thermal electrical plant utilizing either fuel oil or natural gas was to be constructed in the town of Cubellas (Barcelona). Scheduled to enter service in 1977, the plant, which belonged to Térmicas del Besos, S.A., was to have a guaranteed power capacity of 520 megawatts and annual production of 2 billion kilowatt-hours. Térmicas del Besos, S.A., is an affiliate of Hidroeléctrica de Cataluña, S.A. (HECSA), and the INI company, Empresa Nacional Hidroeléctrica del Riborzana, S.A. (ENHER).

Because natural gas was considerably cheaper than crude oil, Spain hoped to obtain imports from Algeria by 1978. A state company, Empresa Nacional del Gas (ENAGAS), was formed to handle present and future supplies and distribution throughout Spain. Plans were made by the company to prospect for gas in Mediterranean littoral areas. About 4% of Spain's energy needs were supplied by natural gas during the year, mostly from Libya. ENAGAS, along with Gaz de France and Socíété Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures (SONATRACH) of Algeria, also studied the possibility of constructing a pipeline between Spain and Algeria.

**Nuclear Energy and Uranium.**—Nuclear powerplant construction continued apace during the year. Four new power stations were under construction: Almaro in Cáceres Province (total capacity of 1,680 megawatts), Lemoniz in Vizcaya Province (production of 1,860 megawatts), and Cofrentes in Valencia Province (975-megawatt group capacity). Fourteen more units were in the planning stage. At year-end, about 3% of total energy output was nuclear. However, under the National Electricity Plan that figure is forecast to rise to 30% and 50%, respectively, for 1980 and 1985. The Spanish agency co-

ordinating the nuclear expansion program, Empresa Nacional del Uranio, S.A. (ENUSA), signed an agreement with Techsnabexport of the U.S.S.R. whereby the latter was to supply uranium-enriching services to Spain. Uranium was to be supplied by European countries (27.5%), the United States (37.9%), and the U.S.S.R. (17.3%). The remainder would be domestically supplied. ENUSA expected to import more than 80% of its fuel supplies through the next decade. In 1973, 67 tons of uranium-bearing yellow cake were imported and 119 tons ($U_3O_8$ content) were domestically produced.

# The Mineral Industry of Sweden

By Thomas S. Jones [1]

Aided by strong national economic conditions, Swedish production of both iron ore and steel continued to advance in 1974 to new record levels. Growth of future steelmaking capacity was given great impetus by parliamentary approval of the "Steelworks 80" project of the state-owned Norrbottens Järnverk AB (NJA). A 4-million-ton-per-year steel plant is to be built, a 60% increase over current Swedish capacity. Private concerns instituted a number of smaller steelmaking expansions. Among nonferrous metals, output of refined copper was about the same as in 1973 but mine production decreased 9%. For other nonferrous metals, chiefly aluminum, lead, zinc, silver, and tungsten, production and trade were either about the same as those of 1973 or generally declining. Among nonmetal mineral commodities, cement output further declined, as the housing industry still failed to show strength. Fertilizer production was up, and Luossavaara-Kiirunavaara AB (LKAB) made plans to convert apatite extracted from iron ore into ammonium phosphate. A large, newly found deposit of feldspar was being evaluated.

In mineral fuels, petroleum imports, which supplied upwards of 70% of Sweden's primary energy, were restrained and declined. Petroleum refinery capacity was to be raised shortly, to about 80% of the 1974 consumption level, by addition of the Scanraff unit. Other expansions of refinery capacity were underway or announced. Coal imports were substantially higher; coke needs can be expected to grow significantly within a few years because of NJA's "Steelworks 80" project. Power from nuclear energy was a matter of controversial attention, with Sweden appearing to move towards development of full fuel cycle capability.

Domestic demand drove the national economy upwards 3.7% to a real gross domestic product of over $38 (constant 1968 prices). The trade deficit for mineral commodities increased 230% to over $2 billion. This was nearly four times the trade deficit for all commodities, and largely resulted from much higher petroleum prices. Other commodities exhibiting significant price increases were iron ore, steel, and fertilizers. Indices of domestic producer prices for mineral commodities increased as follows:[2] Petroleum and coal products, 78%; chemicals and chemical products, 44%; iron and steel, 40%; unwrought nonferrous metals, 27%; ores, minerals, and manufactured products, 25%; and refined copper, 19%. The overall consumer price index increased 10%.

The Government exerted influence over all key metals and fuels, either through ownership, regulatory authority, or parliamentary action. Minerals companies were subject to 1974 government requirements that firms reserve 20% of net profits for financing improvements in working conditions and contribute 15% of net profits to a special investment fund for reducing energy consumption. As in other countries adjusting to a new economic atmosphere stemming from actions of the Organization of Petroleum Exporting Countries, Sweden began an official inquiry into medium- and long-term aspects of all minerals of economic importance to the country.

[1] Physical scientist, Division of Ferrous Metals.
[2] Statistiska Centralbyrån (Stockholm). Allman Månadsstatistik. 1975:8, 1975, pp. 49–53.

## PRODUCTION

Preliminary indices of production volume in the mineral industries in 1973 and 1974 were as follows:

Statistics on production of mineral commodities are detailed in table 1.

| Industry sector | (1968=100) | |
|---|---|---|
| | 1973 | 1974 |
| Iron ore mining | r 120 | 127 |
| All mining and quarrying | r 128 | 142 |
| Primary metals | r 126 | 132 |
| Nonmetallic mineral manufacturing | 107 | 101 |
| Petroleum refining | r 111 | 109 |
| All industry | 127 | 134 |

r Revised.

Source: Statistiska Centralbyrån (Stockholm). Statistiska Meddelanden, Nr. I 1975:12. Feb. 25, 1975, pp. 5–8.

### Table 1.—Sweden: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 p |
|---|---|---|---|
| METALS | | | |
| Aluminum, unalloyed: | | | |
| Primary | 75,992 | 81,399 | 82,008 |
| Secondary | 628 | 260 | 472 |
| Arsenic: | | | |
| White, refined | 16,200 | 15,200 | 13,300 |
| Metallic | 1,100 | 1,100 | 1,100 |
| Bismuth, mine output, metal content e | 15 | 15 | 15 |
| Copper: | | | |
| Mine output, metal content | 30,619 | 44,819 | 40,637 |
| Metal, unrefined | 3,883 | 2,420 | -- |
| Metal, refined: | | | |
| Primary | 41,464 | 47,863 | 47,478 |
| Secondary | 10,132 | 11,628 | 12,430 |
| Total | 51,596 | 59,491 | 59,908 |
| Gold: | | | |
| Mine output, metal content troy ounces | 57,550 | 80,923 | 68,352 |
| Metal including alloys do | 125,902 | 122,141 | 118,990 |
| Iron and steel: | | | |
| Iron ore and concentrate, gross weight: | | | |
| Direct shipping ore thousand tons | 23,917 | 22,107 | 23,643 |
| Concentrates do | 10,062 | 12,620 | 12,509 |
| Total do | 33,979 | 34,727 | 36,152 |
| Pig iron and sponge iron [2] do | 2,533 | 2,759 | 3,176 |
| Electric furnace ferroalloys do | 239 | 226 | 209 |
| Crude steel do | 5,257 | 5,664 | 5,989 |
| Steel semimanufactures: | | | |
| Bars, rods and sections do | r 1,452 | 1,588 | 1,612 |
| Plates and sheets do | 1,896 | 2,048 | 2,127 |
| Strip do | 128 | 142 | 163 |
| Rails and accessories do | 45 | 45 | 50 |
| Pipe and tube stock do | 236 | 229 | 266 |
| Other, including forgings and castings do | 215 | 200 | 249 |
| Total do | r 3,972 | 4,252 | 4,467 |
| Lead: | | | |
| Mine output, metal content | 75,841 | 75,777 | 73,656 |
| Metal (refined): | | | |
| Primary | 47,532 | 46,632 | 45,185 |
| Secondary and remelted | 8,837 | 18,998 | e 18,000 |
| Magnesium metal, primary and secondary | 11 | 9 | e 10 |
| Molybdenum concentrates, roasted | 3,044 | 3,712 | 3,272 |
| Nickel metal, unalloyed | 4,900 | 4,318 | e 4,300 |
| Selenium, elemental (refined) | 42 | 62 | e 62 |
| Silicon metal | 17,959 | 19,381 | NA |

See footnotes at end of table.

## Table 1.—Sweden: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| METALS—Continued | | | |
| Silver: | | | |
| Mine output, metal content ------ thousand troy ounces -- | 4,255 | 4,739 | 4,545 |
| Metal including alloys ---------- do ---- | 5,412 | 6,303 | 6,006 |
| Tungsten, mine output, metal content ---------- | -- | 338 | 268 |
| Uranium oxide ($U_3O_8$) [e] ---------- | 70 | 70 | 70 |
| Zinc: | | | |
| Mine output, metal content ---------- | 113,728 | 118,542 | 113,699 |
| Clinker (70% to 75% zinc) ---------- | 32,400 | 28,200 | 26,900 |
| NONMETALS | | | |
| Cement, hydraulic ---------- thousand tons -- | 3,732 | 3,787 | 3,309 |
| Chalk ---------- | 29,240 | 33,816 | 44,135 |
| Clays, refractory [e] ---------- | 200,000 | 186,000 | 225,000 |
| Diatomite, calcined ---------- | -- | 444 | 566 |
| Feldspar, salable, crude and ground ---------- | 34,091 | 27,955 | 31,964 |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous ---------- thousand tons -- | [r] 504 | 503 | [e] 500 |
| Phosphatic: | | | |
| Thomas slag, gross weight ---------- do ---- | 225 | 143 | 148 |
| Other ---------- do ---- | 504 | 430 | NA |
| Mixed and other ---------- do ---- | [r] 893 | 886 | NA |
| Fluorspar ---------- | -- | 4,636 | 4,074 |
| Lime (quicklime, hydrated lime, and deadburned dolomite) thousand tons -- | 831 | 877 | 912 |
| Pigments, natural mineral ---------- | 1,438 | 1,578 | 1,088 |
| Pyrite and pyrrhotite (including cuperous): | | | |
| Gross weight ---------- thousand tons -- | 486 | 450 | 425 |
| Sulfur content ---------- do ---- | 250 | 232 | 218 |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Unworked: | | | |
| Limestone and marble ---------- do ---- | 49 | 45 | 38 |
| Granite and gneiss ---------- do ---- | 93 | 83 | 72 |
| Quartz ---------- do ---- | 46 | 44 | 47 |
| Quartzite ---------- do ---- | 23 | 31 | 22 |
| Micaceous schist ---------- do ---- | 16 | 20 | 19 |
| Sandstone ---------- do ---- | 49 | 50 | 44 |
| Other ---------- do ---- | 39 | 38 | 36 |
| Worked, all types ---------- do ---- | 123 | 115 | 98 |
| Crushed, broken and other: | | | |
| Clay slate ---------- do ---- | 72 | 81 | 81 |
| Dolomite: | | | |
| Crude ---------- do ---- | 269 | 260 | 307 |
| Burnt ---------- do ---- | 41 | 36 | 37 |
| Granite and gneiss ---------- do ---- | 6,890 | 6,464 | 6,994 |
| Limestone: | | | |
| For cement ---------- do ---- | 5,661 | 5,682 | 4,981 |
| For lime ---------- do ---- | 1,155 | 1,221 | 1,221 |
| For other industrial uses (including lime marl) ---------- do ---- | 1,540 | 1,730 | 1,684 |
| Marble ---------- do ---- | 140 | 149 | 117 |
| Micaceous schist ---------- do ---- | 15 | 16 | 16 |
| Quartz ---------- do ---- | 19 | 21 | 22 |
| Quartzite ---------- do ---- | 1,603 | 1,861 | 1,902 |
| Sandstone ---------- do ---- | 283 | 304 | 353 |
| Other ---------- do ---- | 674 | 544 | 534 |
| Strontium minerals ---------- | 52,558 | 36,359 | 13,394 |
| Sulfur: | | | |
| Elemental (recovered from oil shale) [e] ---------- | 5,000 | 5,000 | 5,000 |
| Sulfuric acid (100%) and oleum ---------- | 934,701 | 927,798 | NA |
| Talc and steatite ---------- | 26,405 | 28,029 | 28,404 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black ---------- | 23,602 | 28,527 | [e] 28,000 |
| Coal, all grades [e] ---------- thousand tons -- | 10 | 10 | 30 |
| Coke: | | | |
| Coke oven ---------- do ---- | 536 | 533 | 481 |
| Gashouse ---------- do ---- | 120 | -- | -- |
| Oil shale: | | | |
| For fuel production use ---------- do ---- | 133 | 126 | 101 |
| For other use ---------- do ---- | 44 | 8 | 11 |
| Peat: | | | |
| For agricultural use ---------- do ---- | 65 | 68 | 73 |
| For fuel use ---------- do ---- | 33 | 28 | 36 |

See footnotes at end of table.

Table 1.—Sweden: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Petroleum refinery products: | | | | |
| Gasoline | thousand 42-gallon barrels | 10,702 | 11,209 | 9,592 |
| Jet fuel | do | 864 | 956 | 950 |
| Kerosine | do | 78 | 333 | 101 |
| Distillate fuel oil | do | 26,177 | 24,594 | 24,833 |
| Residual fuel oil | do | 32,781 | 30,010 | 29,148 |
| Lubricants | do | 588 | 534 | 644 |
| Other: | | | | |
| Naphtha | do | NA | NA | 1,988 |
| White spirit | do | NA | NA | 1,340 |
| Unspecified | do | 9,116 | 2,334 | 566 |
| Refinery fuel and losses | do | 4,240 | 3,812 | 5,501 |
| Total | do | 84,546 | 73,782 | 74,663 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to the commodities listed, cobalt, nickel (as nickel sulfate), and metallic titanium are also produced, but output is not reported and information is inadequate to make reliable estimates of output levels.
[2] Includes sponge iron as follows in thousand tons: 1972—178; 1973—190; 1974—197.

## TRADE [3]

Swedish exports of mineral commodities in 1974 [4] were valued at $2.44 billion,[5] 35% greater than in 1973. Principal export items continued to be iron and steel, iron ore, and nonferrous metals, which accounted for 54%, 18%, and 13%, respectively, of mineral export value. Imports of mineral commodities in 1974 had a value of $4.75 billion, 90% larger than in 1973. Major import items were petroleum and petroleum products, iron and steel, and nonferrous metals, which constituted 55%, 21%, and 11%, respectively, of mineral import value.

The approximate trade deficit for mineral commodities therefore grew in 1974 to $2.3 billion, a 230% increase over the deficit of 1973. In a strong trade year, values of both exports and imports increased for nearly all mineral commodities. However, growth in value, both on a percentage basis and in the total amount, was greatest for petroleum. Thus, large net imports of costlier petroleum mainly caused the increased deficit. For Sweden, the average value of petroleum imports increased 196%, while that for imports of petroleum products increased even more, by 238%.

Trade statistics for mineral commodities in 1972 and 1973 are shown in tables 2 and 3.

[3] Statistiska Centralbyrån (Stockholm). Utrikeshandel 1974. Månadsstatistik—December (SOS). 1975.
[4] Based on the following numerical divisions of the Standard International Trade Classification (SITC): 27, 28, 32, 33, 34, 51.3, 52, 56, 66.1, 66.2, 66.31, 66.7, 67, and 68.
[5] Conversions from Swedish kronor (SKr) to U.S. dollars were made at the following rates: For 1974, SKr 4.4394=U.S.$1.00; for 1973, SKr 4.3673=U.S. $1.00. Source: International Monetary Fund. International Financial Statistics, v. 8, No. 7, July 1975, p. 358.

## Table 2.—Sweden: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Alumina | 26 | 20 | India 10. |
| Metal including alloys: | | | |
| Scrap | 1,144 | 2,164 | West Germany 1,410; Denmark 611. |
| Unwrought | 14,946 | 20,322 | Norway 10,911; People's Republic of China 5,011. |
| Semimanufactures | 33,255 | 42,973 | Denmark 10,159; Finland 7,498; United Kingdom 7,304. |
| Arsenic oxides and acids | 12,638 | 6,965 | NA. |
| Chromium ore and concentrate | 32 | 66 | Mainly to Norway. |
| Cobalt oxide | 2 | (1) | NA. |
| Copper: | | | |
| Ore and concentrate | 14,127 | 36,687 | East Germany 25,835; Bulgaria 5,926. |
| Matte | 40 | -- | |
| Metal including alloys: | | | |
| Scrap | 796 | 423 | West Germany 255; Netherlands 70; Japan 53. |
| Unwrought | 26,801 | 19,011 | West Germany 5,793; United Kingdom 3,609; France 2,923. |
| Semimanufactures | 44,874 | 54,007 | Norway 13,520; Denmark 13,351; United States 6,649. |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite, thousand tons | 27,610 | 32,917 | West Germany 10,363; Belgium-Luxembourg 9,343; United Kingdom 4,749. |
| Roasted pyrite, do | 457 | 379 | West Germany 204; United Kingdom 163. |
| Metal: | | | |
| Scrap, do | 12 | 12 | West Germany 7; Belgium-Luxembourg 2; Denmark 2. |
| Pig iron[2], do | 83 | 140 | People's Republic of China 28; United Kingdom 19; West Germany 14; Japan 14. |
| Ferroalloys, do | 67 | 84 | United Kingdom 32; United States 22; West Germany 18. |
| Steel, primary forms, do | 102 | 111 | Denmark 16; United Kingdom 15; Norway 7. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections, do | 436 | 591 | United Kingdom 92; Finland 76; United States 66. |
| Universals, plates, sheets, do | 764 | 819 | West Germany 152; Denmark 130; Norway 99. |
| Hoop and strip, do | 68 | 87 | Denmark 11; United States 10; Finland 8; United Kingdom 8. |
| Rails and accessories, do | 25 | 18 | Italy 6; Norway 5; West Germany 3. |
| Wire, do | 62 | 74 | United States 14; West Germany 8; France 7. |
| Tubes, pipes, fittings, do | 190 | 231 | West Germany 24; U.S.S.R. 24; Finland 24. |
| Castings and forgings, rough, do | 4 | 3 | Denmark 1; Finland 1; Norway 1. |
| Lead: | | | |
| Ore and concentrate | 55,129 | 57,129 | West Germany 40,038; Netherlands 9,304; Belgium-Luxembourg 7,266. |
| Oxides | 795 | 960 | NA. |
| Metal including alloys, all forms | 37,118 | 30,930 | West Germany 21,402; Norway 3,171. |
| Magnesium metal including alloys: | | | |
| Scrap | 197 | 174 | United States 92; United Kingdom 82. |
| Unwrought and semimanufactures | 3 | 33 | West Germany 20; Denmark 11. |
| Manganese: | | | |
| Ore and concentrate | 303 | 341 | Czechoslovakia 189; Norway 84. |
| Oxide | 76 | 132 | Norway 115; Austria 17. |
| Metal | 136 | 274 | Netherlands 82; Finland 73; France 60. |
| Mercury, 76-pound flasks | 406 | 290 | Norway 116; Denmark 87. |
| Molybdenum ore and concentrate | 1,464 | 634 | United Kingdom 239; West Germany 236; Finland 72. |

See footnotes at end of table.

## Table 2.—Sweden: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Nickel: | | | |
| Ore and concentrate | 5 | 20 | NA. |
| Metal including alloys: | | | |
| Scrap | 679 | 1,223 | West Germany 620; United States 272; Netherlands 179. |
| Unwrought | 2,830 | 2,827 | Netherlands 2,434; West Germany 220. |
| Semimanufactures | 1,566 | 1,533 | France 259; Romania 203; Brazil 179. |
| Platinum-group metals and silver: | | | |
| Waste and sweepings value, thousands | $972 | $5,132 | United Kingdom $2,027; West Germany $1,893; United States $786. |
| Metal including alloys, unworked or partly worked: | | | |
| Platinum group ____ do | $337 | $617 | Finland $384; Denmark $146. |
| Silver ____ thousand troy ounces | 4,855 | 5,433 | Norway 96. |
| Silicon, elemental | 12,807 | 16,905 | United Kingdom 2,845; East Germany 2,831; West Germany 2,616. |
| Tin metal including alloys: | | | |
| Scrap ____ long tons | 28 | 47 | Norway 40; Switzerland 7. |
| Unwrought and semimanufactures do | 135 | 118 | Finland 57; Denmark 24; West Germany 16. |
| Titanium: | | | |
| Ore and concentrate | 100 | -- | |
| Oxide | 33 | 210 | Mainly from West Germany. |
| Tungsten: | | | |
| Ore and concentrate | 107 | 134 | United States 75; United Kingdom 20; West Germany 20. |
| Metal | 26 | 118 | Venezuela 70; Italy 26. |
| Zinc: | | | |
| Ore and concentrate | 216,178 | 224,595 | West Germany 79,514; Norway 46,565; Belgium-Luxembourg 45,498. |
| Oxide and peroxide | 1,110 | 660 | Norway 280; United Kingdom 277. |
| Metal including alloys: | | | |
| Powder | -- | 24 | Norway 16; Poland 6. |
| Scrap | 2,508 | 2,118 | Norway 883; Belgium-Luxembourg 568; Italy 210. |
| Unwrought and semimanufactures | 611 | 3,427 | Netherlands 2,545. |
| Zirconium ore and concentrate | 33 | 17 | All to Norway. |
| Other: | | | |
| Ores and concentrates | 26 | 13 | Portugal 7; Nigeria 3; Dominican Republic 2. |
| Ash and residues containing nonferrous metals | 47,003 | 35,896 | Mainly to Norway. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | 15 | 21 | Brazil 8; Denmark 3. |
| Base metals including alloys, all forms | r 317 | 298 | United Kingdom 106; Netherlands 29. |
| Unspecified | 1 | -- | |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc ____ value, thousands | $7 | $5 | NA. |
| Dust and powder of precious and semiprecious stones ____ do | $5 | $30 | Belgium-Luxembourg $17; Switzerland $9. |
| Grinding and polishing wheels and stones | 2,480 | 2,393 | West Germany 537; France 324; Denmark 317. |
| Asbestos | 9 | 57 | Mainly to West Germany. |
| Borates, crude | 26 | 6 | NA. |
| Cement, hydraulic | 221,073 | 795,916 | NA. |
| Chalk | 6,158 | 7,715 | Denmark 2,681; Norway 2,004; Finland 1,450. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays | 1,051 | 637 | Finland 270; Denmark 133. |
| Products: | | | |
| Refractory (including nonclay bricks) | 28,378 | 36,240 | Norway 11,485; Finland 10,259; Denmark 7,985. |
| Nonrefractory | 29,023 | 53,078 | Denmark 21,331; Norway 12,121. |

See footnotes at end of table.

## Table 2.—Sweden: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Diamond: | | | |
| Gem, not set or strung value, thousands | $183 | $6,785 | Mainly to Belgium-Luxembourg. |
| Industrial do | $45 | $16 | United Kingdom $9; Finland $3. |
| Diatomite, including other infusorial earth | 3,398 | 182 | Finland 70; Yugoslavia 35. |
| Feldspar, fluorspar, etc | 14,971 | 23,157 | United Kingdom 7,669; East Germany 6,200; Austria 3,800. |
| Fertilizer materials: | | | |
| Crude, phosphatic | 199 | 4,822 | All to Norway. |
| Manfauctured: | | | |
| Nitrogenous | 69,222 | 68,116 | Belgium-Luxembourg 4,744; East Germany 3,014; Finland 2,811. |
| Phosphatic | 137,842 | 80,622 | Norway 6,183. |
| Potassic | 3,209 | 6,357 | Belgium-Luxembourg 4,247; West Germany 2,090. |
| Other, including mixed | 22,171 | 25,505 | Norway 12,849. |
| Graphite, natural | 126 | 82 | Mainly to West Germany. |
| Gypsum and plasters | 10 | 1 | NA. |
| Lime | 2,534 | 1,892 | Norway 1,002; Finland 802. |
| Magnesite | 36 | 163 | Denmark 127; Norway 27. |
| Mica, including splittings and waste | 7 | 6 | Mainly to Finland. |
| Pigments, mineral: | | | |
| Crude | 20 | 38 | NA. |
| Iron oxide | 5 | 23 | West Germany 10; Finland 8. |
| Pyrite, unroasted, gross weight | 10,976 | -- | |
| Salt and brine | 349 | 1,930 | Mainly to Norway. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Granite, gneiss, sandstone, etc | 621,527 | 602,698 | Mainly to Netherlands. |
| Marble and other calcareous | 4,558 | 2,934 | Mainly to Denmark. |
| Slate | 7,827 | 14,316 | Norway 7,454; Netherlands 4,324; Denmark 1,237. |
| Worked | 12,105 | 15,213 | Denmark 7,388; Belgium-Luxembourg 2,801; Norway 2,465. |
| Dolomite, chiefly refractory grade | 2,563 | 2,523 | Norway 1,130; Denmark 848; Cuba 246; Finland 246. |
| Gravel and crushed stone thousand tons | 1,186 | 1,176 | West Germany 584; Denmark 526. |
| Limestone | 658,795 | 729,844 | Finland 376,058; West Germany 237,203; Denmark 114,926. |
| Quartz and quartzite | 62,175 | 56,521 | West Germany 23,914; Norway 11,750. |
| Sand, excluding metal bearing | 48,842 | 50,194 | Norway 39,278; Finland 5,836. |
| Sulfur: | | | |
| Elemental, all forms | 68 | 1 | NA. |
| Sulfuric acid | 339,863 | 264,929 | United Kingdom 98,730; Canada 70,831; United States 33,135. |
| Sulfur dioxide | 5,036 | 4,519 | Mainly to Norway. |
| Talc, steatite, soapstone, pyrophyllite | 1,627 | 2,554 | United Kingdom 765; Netherlands 653; Belgium-Luxembourg 610. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 49,260 | 40,981 | United Kingdom 31,526; Denmark 5,363. |
| Slag, dross and similar waste, not metal bearing | 65,148 | 55,501 | Norway 45,795; Liberia 8,800. |
| Oxides, hydroxides of magnesium, strontium and barium | 64 | 51 | Denmark 26; Norway 15; Finland 7. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt, natural | 35 | 12 | NA. |
| Carbon black | 5,926 | 7,012 | Finland 2,673; Norway 2,177; Denmark 717. |
| Coal and coke, including briquets | 4,090 | 24,427 | Liberia 11,007; Finland 6,735; Norway 4,926. |
| Hydrogen, nitrogen and rare gases | 268 | 2,817 | Mainly to Denmark. |
| Peat including briquets and litter | 21,226 | 19,154 | Denmark 11,802; Norway 4,752. |
| Petroleum refinery products: | | | |
| Gasoline thousand 42-gallon barrels | 1,496 | 551 | Norway 273; Denmark 247. |
| Jet fuel do | 198 | 5 | All to Finland. |
| Kerosine do | 81 | 93 | Norway 59; Denmark 29. |

See footnotes at end of table.

## Table 2.—Sweden: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum and refinery products—Continued | | | |
| Distillate fuel oil thousand 42-gallon barrels | 2,843 | 3,362 | Denmark 1,723; Norway 1,100. |
| Residual fuel oil ---- do | 5,013 | 3,280 | Denmark 1,979; United States 626; Norway 599. |
| Lubricants ---- do | 451 | 542 | Norway 147; Finland 121; Denmark 105. |
| Other: | | | |
| Liquefied petroleum gas do | 387 | 259 | Denmark 189; Norway 69. |
| Naphtha ---- do | 1,019 | 731 | Mainly to United Kingdom. |
| Unspecified ---- do | 1,444 | 1,809 | Denmark 769; Norway 520; West Germany 312. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 19,026 | 15,307 | Denmark 9,575; Netherlands 4,372; France 1,278. |

r Revised. NA Not available.
1 Less than ½ unit.
2 Includes shot, grit, sponge, spiegeleisen, etc., of iron and steel.

## Table 3.—Sweden: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 45,823 | 48,772 | Greece 26,142; Australia 14,155; Guyana 6,939. |
| Alumina | 202,294 | 188,020 | Jamaica 101,812; United States 59,378; West Germany 24,065. |
| Metal including alloys: | | | |
| Scrap | 1,525 | 4,160 | East Germany 2,530; Norway 1,533. |
| Unwrought | 33,701 | 42,317 | Norway 21,440; Ghana 10,856. |
| Semimanufactures | 35,156 | 41,757 | Norway 10,893; West Germany 5,004. |
| Chromium: | | | |
| Chromite | 146,177 | 247,394 | U.S.S.R. 184,901; Turkey 35,471. |
| Oxide and hydroxide | 2,176 | 2,805 | U.S.S.R. 931; West Germany 931; France 808. |
| Cobalt and hydroxide | 5 | 5 | Belgium-Luxembourg 4. |
| Copper: | | | |
| Ore and concentrate | 39,693 | 44,902 | Norway 24,864; Ireland 16,528. |
| Matte | 7,159 | 10,589 | All from France. |
| Metal including alloys: | | | |
| Scrap | 4,974 | 6,155 | France 2,258; United States 1,716; Netherlands 1,449. |
| Unwrought | 68,714 | 62,847 | Chile 19,564; Belgium-Luxembourg 12,851; Zambia 6,655. |
| Semimanufactures | 24,404 | 26,273 | United Kingdom 9,427; West Germany 4,333; Finland 4,287. |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite | 139 | (1) | All from Belgium-Luxembourg. |
| Roasted pyrite | 898 | -- | |
| Metal: | | | |
| Scrap | 198,065 | 278,333 | U.S.S.R. 143,625; Poland 58,296; Denmark 34,004. |
| Pig iron, including cast iron | 352,670 | 343,934 | U.S.S.R. 116,726; Finland 57,536; West Germany 50,334. |
| Ferroalloys | 129,024 | 203,837 | Norway 72,673; Greece 19,957; Republic of South Africa 18,483. |
| Steel, primary forms | 158,261 | 172,896 | Finland 128,466; West Germany 23,338; Spain 8,302. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes and sections | 443,332 | 505,993 | Belgium-Luxembourg 118,214; West Germany 115,648; France 61,827. |

See footnotes at end of table.

## Table 3.—Sweden: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Metal—Continued | | | |
| Semimanufactures—Continued | | | |
| Universals, plates and sheets | 947,506 | 1,041,172 | West Germany 220,482; Netherlands 123,134; Belgium-Luxembourg 16,026. |
| Hoop and strip | 112,081 | 120,386 | Poland 39,050; West Germany 22,859; Belgium-Luxembourg 16,026. |
| Rails and accessories | 3,387 | 5,211 | West Germany 2,125; Norway 1,272; United Kingdom 1,194. |
| Wire | 20,373 | 22,266 | United Kingdom 6,823; Belgium-Luxembourg 4,532; Denmark 2,573. |
| Tubes, pipes and fittings | 235,369 | 277,979 | West Germany 78,822; United Kingdom 53,780; Austria 29,381. |
| Castings and forgings, rough | 7,070 | 9,919 | Poland 5,671; Norway 1,642. |
| Total | 1,769,118 | 1,982,926 | |
| Lead: | | | |
| Oxides | 1,205 | 1,521 | United Kingdom 1,281; East Germany 185. |
| Metal including alloys: | | | |
| Unwrought | 4,629 | 4,144 | United Kingdom 2,809; Denmark 544. |
| Semimanufactures | 1,515 | 1,827 | West Germany 693; Belgium-Luxembourg 534; Netherlands 234. |
| Magnesium metal including alloys: | | | |
| Unwrought, including scrap | 912 | 1,054 | Norway 912; U.S.S.R. 79. |
| Semimanufactures | 94 | 173 | Norway 51; West Germany 49; France 34. |
| Manganese: | | | |
| Ore and concentrate | 101,820 | 60,391 | Republic of South Africa 31,408; U.S.S.R. 19,965; Ghana 6,846. |
| Oxides | 1,141 | 2,276 | Japan 902; People's Republic of China 737; Belgium-Luxembourg 434. |
| Mercury 76-pound flasks | 1,363 | 2,205 | Mainly from Spain. |
| Molybdenum: | | | |
| Ore and concentrate | 5,903 | 8,237 | United States 4,200; Netherlands 2,745. |
| Metal including alloys, all forms | 51 | 65 | United States 20; Austria 13; West Germany 12; Poland 12. |
| Nickel: | | | |
| Matte | 1,488 | 3,789 | Canada 1,943; U.S.S.R. 1,546. |
| Metal including alloys: | | | |
| Scrap | 453 | 472 | United States 339; France 48; Romania 46. |
| Unwrought | 15,377 | 12,069 | Norway 3,249; United Kingdom 2,480; Australia 1,845. |
| Semimanufactures | 4,802 | 5,357 | Netherlands 4,304; United Kingdom 580. |
| Platinum-group metals and silver: | | | |
| Ore and concentrate value, thousands | $2,914 | $759 | Mainly from Peru. |
| Waste and sweepings do | $1,014 | $2,735 | France $1,914; United States $345; United Kingdom $255. |
| Metals including alloys, unwrought or partly worked: | | | |
| Platinum group do | $2,252 | $3,338 | United Kingdom $2,062; West Germany $852; Switzerland $270. |
| Silver do | $7,324 | $8,822 | United Kingdom $4,563; West Germany $2,726; Norway $990. |
| Tantalum | -- | 1 | Mainly from West Germany. |
| Tin: | | | |
| Oxide long tons | 39 | 64 | United Kingdom 31; West Germany 31. |
| Metal including alloys: | | | |
| Unwrought, including scrap do | 543 | 487 | United Kingdom 333; Norway 42; Netherlands 32. |
| Semimanufactures do | 158 | 180 | United Kingdom 130; West Germany 27. |

See footnotes at end of table.

Table 3.—Sweden: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Titanium: | | | |
| Ore and concentrate | 2,927 | 3,754 | Australia 3,433; India 303. |
| Oxide | 5,574 | 5,062 | West Germany 1,623; Finland 1,212; Czechoslovakia 608. |
| Tungsten: | | | |
| Ore and concentrate | 2,397 | 2,442 | Thailand 923; People's Republic of China 658; Brazil 620. |
| Metal including alloys, all forms | 21 | 200 | West Germany 172; United Kingdom 19. |
| Zinc: | | | |
| Oxide | 2,284 | 1,969 | Netherlands 1,078; Norway 463; Czechoslovakia 137. |
| Metal including alloys: | | | |
| Blue powder | 122 | 175 | Norway 142; United Kingdom 33. |
| Scrap | 18 | 43 | All from Denmark. |
| Unwrought | 42,893 | 45,496 | Norway 29,553; Finland 10,609; Poland 2,731. |
| Semimanufactures | 1,356 | 1,531 | West Germany 802; Norway 467. |
| Other: | | | |
| Ores and concentrates, n.e.s | 483 | 1,562 | Australia 908; France 476; Colombia 137. |
| Ash and residues containing nonferrous metals, n.e.s | 41,134 | 64,232 | West Germany 29,420; United States 9,987; United Kingdom 8,259. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | 1,867 | 2,164 | West Germany 662; Finland 443; United Kingdom 302. |
| Metals including alloys, all forms | 5,900 | 5,963 | Netherlands 604; Norway 203; West Germany 120. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 400 | 899 | United States 547; Italy 185; Greece 85. |
| Dust and powder of precious and semiprecious stones value, thousands | $640 | $1,067 | United States $578; United Kingdom $253; Netherlands $135. |
| Grinding and polishing wheels and stones | 2,701 | 3,078 | United Kingdom 931; Austria 896; United States 424. |
| Asbestos | 15,532 | 18,679 | Canada 7,866; U.S.S.R. 6,879; Cyprus 2,676. |
| Barite and witherite | 2,185 | 3,568 | Mainly from West Germany. |
| Boron: | | | |
| Crude natural borates | 14,918 | 17,149 | United States 12,208; Turkey 2,901; Netherlands 2,020. |
| Oxide and acid | 691 | 803 | France 257; Turkey 227; United States 143. |
| Cement | 24,864 | 27,434 | Denmark 16,959; Finland 4,966; West Germany 2,327. |
| Chalk | 12,118 | 21,963 | West Germany 10,631; Denmark 7,847; France 1,824. |
| Clays and clay products, including all refractory brick: | | | |
| Crude clays, n.e.s | 264,702 | 295,946 | Mainly from United Kingdom. |
| Products: | | | |
| Nonrefractory | 37,228 | 40,713 | Poland 18,939; Denmark 6,159; Netherlands 4,585. |
| Refractory, including nonclay bricks | 108,778 | 141,536 | Austria 45,313; United Kingdom 37,979; West Germany 26,428. |
| Cryolite and chiolite | 1,704 | 831 | All from Denmark. |
| Diamond: | | | |
| Gem, not set or strung value, thousands | $2,415 | $8,338 | U.S.S.R. $4,796; Belgium-Luxembourg $2,221; Israel $957. |
| Industrial do | $935 | $1,183 | Netherlands $477; United Kingdom $332; Republic of South Africa $187. |
| Diatomite and other infusorial earth | 6,013 | 4,743 | United States 2,092; Denmark 1,472; Iceland 440. |

See footnotes at end of table.

## Table 3.—Sweden: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 18,824 | 21,656 | All from Chile. |
| Phosphatic | 545,969 | 626,985 | Morocco 324,874; U.S.S.R. 213,074; United States 83,007. |
| Manufactured: | | | |
| Nitrogenous | 530,674 | 485,493 | Mainly from Norway. |
| Phosphatic | 39,250 | 17,440 | Tunisia 9,651; Netherlands 7,757. |
| Potassic | 248,356 | [2] 1,387 | West Germany 1,372. |
| Other | 126,772 | 127,841 | Norway 80,252; Netherlands 24,031. |
| Ammonia | 90,554 | 108,915 | Mainly from Norway. |
| Fluorspar, feldspar, leucite, etc | 11,819 | 21,743 | People's Republic of China 5,424; Finland 3,998; West Germany 3,575. |
| Graphite, natural | 1,035 | 1,284 | People's Republic of China 327; Austria 326; West Germany 314. |
| Gypsum and plasters | 501,784 | 470,954 | Poland 174,104; Spain 106,279; France 91,186. |
| Lime | 3,919 | 10,857 | Mainly from Denmark. |
| Magnesite | 9,865 | 6,249 | Austria 1,662; Greece 1,525; People's Republic of China 1,100. |
| Mica, all forms | 1,033 | 1,217 | Norway 432; United Kingdom 370; West Germany 125. |
| Pigments, mineral: | | | |
| Natural, crude | 144 | 97 | West Germany 44; Austria 26. |
| Iron oxides, processed | 6,318 | 7,863 | Mainly from West Germany. |
| Precious and semiprecious stones, except diamond value, thousands | $368 | $630 | West Germany $312; Austria $139; Switzerland $60. |
| Pyrite, unroasted | 115,024 | 70,496 | Mainly from Norway. |
| Salt | 966,964 | 1,074,317 | Netherlands 476,273; West Germany 215,918; United Kingdom 163,714. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 69,574 | 44,143 | Mainly from Belgium-Luxembourg. |
| Caustic potash | 462 | 2,769 | Canada 1,681; West Germany 674; France 346. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Marble and other calcareous stone | 1,520 | 964 | Italy 623; Belgium-Luxembourg 295. |
| Slate | 2,353 | 2,499 | Norway 2,043; Finland 333. |
| Other including granite, gneiss, etc | 3,490 | 5,764 | Norway 1,964; Denmark 1,950; Finland 741. |
| Worked, all types | 10,595 | 12,209 | Portugal 8,287; Italy 1,564. |
| Dolomite, chiefly refractory grade | 20,858 | 23,061 | Mainly from Norway. |
| Gravel and crushed stone | 76,168 | 56,328 | Denmark 22,624; Finland 11,316; Norway 6,784. |
| Limestone (except dimension) | 115,676 | 117,359 | United Kingdom 73,019; Denmark 37,425. |
| Quartz and quartzite | 31,191 | 32,978 | Portugal 23,148; Spain 8,961. |
| Sand, excluding metal bearing | 613,247 | 337,258 | Denmark 226,283; Belgium-Luxembourg 93,812. |
| Sulfur: | | | |
| Elemental, all forms | 92,288 | 100,712 | Poland 64,815; Finland 27,524. |
| Sulfuric acid, including oleum | 78,950 | 112,499 | Poland 66,722; Finland 41,948. |
| Sulfur dioxide | 3,077 | 3,997 | West Germany 3,429; Norway 567. |
| Talc, steatite, soapstone, and pyrophyllite | 22,088 | 22,923 | Norway 11,383; Austria 3,658; Belgium-Luxembourg 2,977. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 43,601 | 80,402 | Norway 35,654; West Germany 34,810; Denmark 4,351. |
| Slag, dross and similar waste, not metal bearing | 1,003 | 4,112 | Mainly from Finland. |
| Oxides and hydroxides of magnesium, strontium, and barium | 14,925 | 20,339 | Norway 12,090; Spain 3,701; United Kingdom 2,037. |
| Bromine, iodine, and fluorine | 12 | 11 | United Kingdom 5; Chile 4; Japan 2. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 708 | 886 | Trinidad and Tobago 435; United States 379. |
| Carbon black | 10,995 | 10,097 | West Germany 4,241; United Kingdom 3,444; Netherlands 1,478. |

See footnotes at end of table.

Table 3.—Sweden: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Coal and briquets: | | | |
| Anthracite and bituminous coal thousand tons | 985 | 1,027 | U.S.S.R. 371; Poland 315; United States 241. |
| Coal briquets | 150 | -- | |
| Lignite and lignite briquets | 6,484 | 9,836 | East Germany 5,594; Yugoslavia 4,154. |
| Coke and semicoke -- thousand tons | 1,208 | 1,495 | West Germany 841; United Kingdom 219; U.S.S.R. 216. |
| Hydrogen, helium, and rare gases | 854 | 862 | West Germany 548; Denmark 138; Netherlands 146. |
| Peat and peat briquets | 615 | 603 | Poland 296; Finland 261. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 82,684 | 78,161 | Nigeria 17,317; Iran 14,828; Venezuela 9,649. |
| Refinery products: | | | |
| Gasoline do | 17,969 | 18,884 | United Kingdom 5,000; Denmark 4,044; Trinidad and Tobago 2,956. |
| Jet fuel do | 1,035 | 1,406 | United Kingdom 713; Netherlands 366; Belgium-Luxembourg 252. |
| Kerosine do | 1,566 | 1,712 | United Kingdom 654; U.S.S.R. 400; Belgium-Luxembourg 339. |
| Distillate fuel oil do | 47,950 | 51,667 | United Kingdom 17,235; Belgium-Luxembourg 6,154; Denmark 6,020. |
| Residual fuel oil do | 57,660 | 57,498 | U.S.S.R. 17,836; Belgium-Luxembourg 8,158; Netherlands 7,504. |
| Lubricants do | 1,234 | 1,114 | United Kingdom 345; West Germany 262; United States 223. |
| Other: | | | |
| Liquefied petroleum gas do | 154 | 257 | Netherlands 150; United Kingdom 48; Denmark 28. |
| Naphtha do | 7,647 | 8,375 | Saudi Arabia 2,268; Italy 1,884; Norway 1,387. |
| Mineral jelly and wax do | r 125 | 141 | West Germany 75; East Germany 15; United Kingdom 17. |
| Pitch, resin, petroleum, asphalt, petroleum coke, and other byproducts do | 1,102 | 1,283 | United States 489; West Germany 273; Denmark 254. |
| Unspecified do | r 587 | 424 | Netherlands 181; Belgium-Luxembourg 103; Denmark 91. |
| Total do | r 137,029 | 142,761 | |
| Mineral tar and other coal, petroleum-, or gas-derived crude chemicals | 32,800 | 33,352 | Netherlands 9,827; Denmark 7,159; Belgium-Luxembourg 7,024. |

r Revised.
1 Less than ½ unit.
2 Partial figure; excludes an unspecified quantity valued at $10,207,000.

## COMMODITY REVIEW

### METALS

**Aluminum.**— The sole producer of primary metal, Gränges Aluminium (division of Gränges AB), experienced a year of full production at both smelting and rolling facilities, although its press products operations dropped off in the latter half of the year. Production of primary aluminum at Sundsvall was 82,000 tons, nearly unchanged from 1973, while production of foundry alloys at Mansbo grew 8% to 13,000 tons, and shipments of semimanufactures from Finspång increased by 3% to 74,000 tons.

Imports of raw materials for aluminum manufacture included 188,000 tons of aluminum oxide and hydroxide, the same as in 1973, and 97,000 tons of bauxite. Bauxite imports were nearly double those in 1973, possibly in anticipation of expansion of the Sundsvall smelter. Annual capacity of this smelter is to be raised to 132,000 tons from the present 85,000 tons at an estimated cost of $75 million. Environmental effects of the proposed expansion have been under study by the Government, which has proposed as an alternative the construction

of a new smelting plant in northern Sweden. Completion of the expansion at whatever site chosen is not expected before 1977. Production capacity for building sheet at Finspång is also to be enlarged at a cost of about $15 million. Gränges Metallverken, another division of Gränges AB, has begun adapting techniques developed for automated zinc diecasting to aluminum diecasting.[6]

Exports of aluminum in 1974 decreased about 1% overall from the 1973 total, as exports of unwrought metal dropped nearly one-half to 12,000 tons, while exports of semimanufactures increased about one-fifth to 51,000 tons. The annual rate of increase in imports advanced slightly to 24%; 54,000 tons of unwrought metal and 50,000 tons of semimanufactures were imported. Consumption of primary aluminum was reported to have declined to 83,000 tons, a decrease of 17% from 1973.[7]

**Arsenic.**—Production of arsenic trioxide by Boliden AB decreased about 13% from the 1973 volume to 13,300 tons, partly because crude arsenic was of lower grade. The new metallic arsenic plant, with a production capacity of 1,500 tons per year, that was to have gone into operation in mid-1974, proved more difficult to start up than expected. Consequently, the timetable for increasing production of metal was not met. Early in the year Boliden was reportedly engaged in a marketing controversy over profitmaking by resellers of Boliden material.[8]

**Copper.**—Swedish mine production, measured as copper contained in concentrates, decreased 9% to 40,600 tons. However, production of total refined copper (primary plus secondary) at just under 60,000 tons advanced hardly at all.[9]

At Boliden, sales diminished by 6%, even though prices averaged 32% higher than in 1973. Copper content of mine output by Boliden decreased to 36,000 tons because of lower copper content in Aitik ore and production losses caused by the need for mill repairs at Aitik. Ore production at the Aitik mine climbed 3% to 6.1 million tons. Production of electrolytic copper increased by 400 tons to 59,000 tons of which 28,500 tons was produced from Boliden material. Blister copper, which in 1973 had amounted to 2,400 tons, was not produced.

Expansion of Boliden's Stekenjokk mine continued, as did installation of a plant for cleaning gases from copper roasting furnaces. Acquisition of additional open pit mining machinery and support facilities was authorized for the Aitik mine. On the condition that a satisfactory license could be obtained for continued operation of the Rönnskär smelter, new projects approved for the smelter included: A Kaldo plant for recovering residual copper from copper converter slag simultaneously with smelting of copper concentrates; a central plant for scrubbing process gases; and an additional sulfur dioxide plant. The Kaldo plant will increase smelting capacity to about 85,000 tons of copper per year and will considerably lower energy consumption for smelting. In March 1974, Boliden committed another $500,000 to the joint mine–concentrator copper-nickel project with Great Lakes Nickel Ltd. in Ontario. This latest commitment was mainly for surface and underground development work.

Deliveries of copper and alloy semimanufactures by the Gränges Metallverken division of Gränges AB were 118,000 tons, slightly more than in 1973. In 1974, new tube-producing facilities began operating at Granefors and Västerås, and Töcksfors Verkstads AB was acquired. Töcksfors Verkstads has wire and cable facilities at Töcksfors, Årjäng, and Koppom; investments are being made in production of underground and overhead cables at Töcksfors.

Trade in unwrought copper and alloys increased over 1973, by 8% to 20,500 tons for exports and by 12% to 70,400 tons for imports. Trade in semimanufactures was practically unchanged, exports decreased 1,000 tons to 53,000 tons and imports increased by the same amount to 27,000 tons. Consumption of refined copper in 1974 was down 8% to 104,500 tons.

**Ferroalloys.**—Production of ferroalloys containing chromium, silicon, manganese, and the refractory metals decreased 5% overall to 214,000 tons. The major change from the 1973 production pattern was a 70% increase in the production of high-carbon ferrochrome, to 62,000 tons. The increase in ferrochrome production con-

[6] Huskonen, W. D. Automatic Zinc Diecasting in Sweden. Foundry, v. 102, No. 2, February 1974, pp. 75–76.
[7] World Bureau of Metal Statistics (London). World Metal Statistics, v. 28, No. 8, August 1975, p. 10.
[8] Metal Bulletin. No. 5869. Feb. 14, 1974. p. 32.
[9] Statistiska Centralbyrån (Stockholm). Bergshantering 1974. 1975, pp. 89, 97.

trasted to declines in production of all other ferroalloys; ferromanganese was not produced at all in 1974. Sales of ferroalloys amounted to 85% of production at prices averaging 48% greater than in 1973. Volume of trade in ferroalloys continued at levels comparable to production volume. As many tons of ferroalloys were imported as produced. Volume of exports was two-fifths production volume, to give net imports of 129,000 tons, 60% the volume of production. Ferronickel and ferromanganese were major import items, accounting together for 86% of net ferroalloy imports.

The new "COBO" cold-bonding process is scheduled to be put into operation in 1975 at the Tröllhättan plant of AB Ferrolegeringar. In this application, silica dust that was formerly a waste product will be used as the binder. Cold-bonding is to be achieved by autoclaving at about 200° C in the presence of water, according to methods developed at the Royal Institute of Technology in Stockholm.[10]

**Iron Ore.**—Production and exports of iron ore again both advanced to record levels in 1974. Production increased 4% to 36.152 million tons, whereas exports grew only 0.6% to 33.105 million tons. Value of exports in 1974 was equivalent to about $429 million, 20% more in terms of dollars than in the previous year, and nearly 22% higher when expressed in Swedish kronor. Average unit value of iron ore exported in 1974 (SKr 56.8 per ton) similarly increased by 21% compared with 1973. The 1974 figures for price and value reflect price increases negotiated in late 1973 of about 25% for 1974 iron ore delivery contracts.

Production and shipments of iron ore by the principal producers in 1974 were as follows, in thousand tons:

| Company | Production | Shipments | | |
|---|---|---|---|---|
| | | Export | Domestic | Total |
| Luossavaara-Kiirunavaara AB (LKAB) | [1] 30,000 | 29,727 | 1,467 | 31,194 |
| Tuolluvaara Gruv AB (TGA) [2] | NA | NA | NA | 957 |
| Gränges AB | [3] 3,288 | [e] 1,664 | [e] 1,721 | 3,385 |
| Stora Kopparbergs Bergslags AB (SKB) [4] | 1,550 | NA | NA | 1,718 |

NA Not available. [e] Estimate.
[1] Including 7.7 million tons of pellets.
[2] Shipments for TGA as reported by LKAB.
[3] Including 1.2 million tons of pellets, of which 0.8 million were cold-bonded.
[4] Including contributions from AB Dannemora Gruvor.
Source: 1974 Annual Reports for LKAB, Gränges AB, and SKB, and data reported in Skillings' Mining Review, v. 64, 1974: No. 6, Feb. 8, p. 13 (LKAB); No. 8, Feb. 22, p. 4 (Gränges AB); No. 10, March 8, p. 12 (SKB).

Stocks of iron ore at Swedish mines at yearend 1974 totaled 4.6 million tons, down from the yearend stocks of 1973 which totaled 6.2 million tons. The drop in stocks of about 2 million tons for the second consecutive year came as shipments continued to exceed production. Production was hampered by several factors including labor troubles.

Exports of Swedish iron ore products in 1974 included 7.7 million tons of pellets, 8.2 million tons of unagglomerated ore fines and concentrate, and 17.3 million tons of lump ore. Exports of pellets by LKAB were about 1.6 million tons more than in 1973. Shipments by LKAB through the Norwegian port of Narvik totaled 22.1 million tons at an average cargo weight of 44,300 tons. Work was underway on a new 208-meter quay to expand shipping facilities at Narvik. This quay is to be completed in 1977 and will raise annual port capacity to 30 million tons from 23 million tons. The quay will accommodate ships of 150,000 tons and upwards, in comparison with present facilities for ships up to 100,000 tons. On the Baltic, LKAB shipments through Luleå amounted to 7.8 million tons in 1974 at an average cargo weight of 19,200 tons. Limited winter shipping was done using ships strengthened for ice and with the aid of ice breakers.

In December 1974, state-owned LKAB acquired both ferrous and nonferrous ore mining companies. All shares of Tuolluvaara Gruv AB (TGA) were acquired on December 2. TGA has been producing about 1 million tons per year from a mine

[10] Hassler, B., and P. G. Kihlstedt. Design Principles of the COBO Process as a Method of Agglomerating Mineral Concentrates. Paper in Swedish Mining Mission to USA, May 1975, 11 pp.

at Kiruna and operated at a loss in 1974. AB Statsgruvor, a state-owned company with which LKAB has had close ties for some years, was acquired at yearend 1974. Statsgruvor operated mines in central Sweden from which lead, zinc, tungsten, and copper concentrates are obtained. Iron ore prospecting activities by LKAB included completion of initial deep-level surveys towards the 1,000-meter level at Malmberget and evaluation of depostis at Norrbotten. Dolomite pellets were produced on a trial basis at the new pelletizing plant at Malmberget, and were given full-scale trials for blast furnace use in Poland and for direct reduction at Canadian and West German plants.

The change to mining by continuous block caving methods proceeded at the Grängesberg mine of Gränges.[11] This change, stemming from a 1971 decision to operate the mine with trackless equipment, is expected to be completed in late 1976, and will replace mining by block caving plus some sublevel caving. Gränges decided in 1974 to increase its investment in facilities for producing low-phosphorous concentrate at Grängesberg with new equipment to be installed by 1977.

Stora Kopparbergs acquired AB Dannemora Gruvor from Fagersta AB effective March 1974. Also adding to Stora Kopparberg's future prospects, was the delineation of an estimated 50 million tons of ore comprising mostly 40% iron at Vintjärn.

Swedish iron ore mining companies agreed to provide technical assistance and advice on several foreign deposits in Africa and the Middle East. LKAB was carrying out studies of ore in the Nimba region of Guinea and at Gara Djebilet in Algeria. Gränges was collaborating with the National Iranian Steel Industries Corp. on development of deposits at Gol-e-Gohar in southern Iran which, beginning in 1978, are expected to yield 5 million tons per year of ore with 60% iron.

**Iron and Steel.**—Production, trade, and consumption of iron and steel in 1974 showed moderate or strong advances in volume in all categories except exports. Compared with 1973, production was up 6%, exports were virtually unchanged, imports increased 8%, and steel consumption increased 8% to 4.63 million tons. The iron and steel industry operated overall at about 86% of capacity to produce just under 6 million tons of raw steel and 4.3 million tons of finished steel. These new alltime highs continued production trends of recent years.

The index of Swedish producer prices for iron, steel, and ferroalloys in 1974 averaged 40% higher than in 1973. For steel semimanufactures, the average value of Swedish exports in 1974 was equivalent to $634 per ton ($476 in 1973), while the average value of imports was equivalent to $355 per ton ($255 in 1973). Several producers reported higher profits than in 1973; however, state-owned Norrbottens Järnverk AB (NJA) again reported a loss, partly attributed to long-term delivery contracts at fixed prices proving too low. Investment in the iron and steel industry in 1974 was estimated at $208 million, only slightly above the 1973 figure of $200 million.

Annual production capacities for pig iron and raw steel in Sweden at yearend were about 4.0 million and 7.1 million tons, respectively.[12] Compared with 1973, this represented an increase of 7% for pig iron and 3% for raw steel. Completion of a blast furnace by Surahammars Bruks AB was largely responsible for growth in pig iron capacity. Production capacity for sponge iron increased in 1974 by nearly one-third to 257,000 tons per year, reversing the capacity drop in 1973. The increase resulted from putting into operation a 60,000-ton-per-year tunnel kiln by Höganäs AB. Auxiliary equipment for this 260-meter kiln is to be installed in 1975.

Distribution of steelmaking capacity by process was practically the same as in 1973, as follows: Oxygen, 41%; electric (mostly arc), 40%; and open-hearth, 19%. At 29%, the proportion of alloy and high-carbon steel in total steel production was also nearly unchanged.

The year 1974 promised to be a milestone for the Swedish steel industry. In May, parliamentary approval was given for NJA's "Steelworks 80" project, to build a new integrated iron and steelworks at the company's Luleå site in northern Sweden. When completed, at a cost now estimated in excess of $1 billion, the new plant would produce over 4 million tons of crude steel per year, a 60% increase over current Swedish capacity. Furthermore, the

[11] Mining Magazine. Grangesberg: Changeover to Continuous Block Caving. V. 132, No. 6, June 1975, pp. 418–431.

[12] Jarnverksföreningen (Stockholm). Svensk Jarnstatistik. No. 1, May 27, 1975, table 15.

project represents a break from traditional Swedish steelmaking philosophy. Using ore from nearby LKAB mines, mass production of ordinary commercial steels will be the goal rather than production of stainless and specialty steel as has been characteristic of the industry. The project has generated considerable controversy within Sweden. However, the argument advanced that trends in world markets favor such a plant gained support from interest shown by at least one Japanese steelmill in taking one-half million tons of crude steel per year for 5 years beginning in 1979. NJA planners visualize that 90% of the output of the plant will be exported, mostly to western Europe.

Basic, bottom-blown (OBM) converters were among steelmaking installations completed or started in Sweden in 1974. At the Domnarvet works of SKB, a 30-ton unit that made steel by the Swedish-developed Kaldo process was converted to an OBM unit as of August. OBM steelmaking at Domnarvet was preceded in February by startup of a 35-ton unit at Surahammars Bruks AB. The installation at Surahammars was initially planned as a conventional top-blown converter, but was changed to a greenfield OBM plant. Gränges announced plans to install a Linz-Donawitz (LD) converter at the Oxelösunds works of Gränges Steel. The unit, reported to be 180-ton, is scheduled to be in production by 1977 as part of a program to expand capacity for crude steel by 50%.

In stainless and alloy steelmaking, Gränges' Nyby Bruk AB began operating a 60-ton argon-oxygen-decarburization (AOD) unit in 1974, and Sandvik AB began installation of a similarly sized AOD unit reportedly to start production in 1975. Production by the Creusot-Loire-Uddeholm (CLU) process, a joint Swedish-French development, was pioneered by Uddeholms AB in a 70-ton converter beginning in late 1973. In the CLU process, the diluting gas during decarburization is steam rather than argon as used in the AOD process, leading to potential savings estimated at $10 to $20 per ton. Fagersta AB decided to increase ingot capacity for high-speed steel by putting into operation by 1977 a new plant with a 25-ton arc furnace. SKF planned to add a new twin-furnace steelmaking plant at Hofors. At Avesta Jernverks AB a cold strip mill is to be replaced in 1976 by a new mill capable of producing 40,000 tons per year of sheet and plate in widths up to 2 meters.

Production of crude forms of alloy and high-carbon steel in 1973 and 1974 is shown by the following tabulation in thousand tons.

| Type of steel | 1973 | 1974 |
|---|---|---|
| Stainless | 467 | 519 |
| Heat-treatable, case-hardening, and spring | 307 | 365 |
| High-carbon (unalloyed) | r 229 | 241 |
| Tool | 108 | 119 |
| High-speed | 29 | 34 |
| Free-machining | 13 | 13 |
| Other, including ball-bearing | 442 | 446 |
| Total | 1,595 | 1,737 |

r Revised.

Imports of steelmaking raw materials in 1974 included 209,000 tons of pig iron, 368,000 tons of iron and steel scrap, 270,000 tons of chromite, 37,800 tons of manganese ore, 8,500 tons of molybdenum concentrate, 13,800 tons of unwrought nickel, 711 tons of vanadium pentoxide and other compounds and 14,400 tons of fluorspar.

Consumption of selected raw materials in the manufacture of pig iron, sponge iron, ferroalloys, and raw steel in 1974 is shown in table 4.

Table 4.—Consumption of selected raw materials
(Thousand metric tons unless otherwise specified)

| Materials | Used in production of | | | |
|---|---|---|---|---|
| | Pig iron | Sponge iron [1] | Ferro-alloys | Raw steel |
| Metallic: | | | | |
| Iron ore: | | | | |
| Lump | 257 | -- | -- | 21 |
| Concentrates (unagglomerated) | -- | 203 | 1 | 1 |
| Pellets | 1,423 | 76 | (2) | 81 |
| Sinter [3] | 3,175 | -- | -- | (2) |
| Scrap: (including purchased) | | | | |
| Iron | 10 | -- | -- | 227 |
| Steel: | | | | |
| Stainless | -- | -- | -- | 299 |
| Other | 5 | -- | 26 | 3,173 |
| Pig iron | -- | -- | -- | 2,837 |
| Manganese: | | | | |
| Ore | -- | -- | 11 | -- |
| Metal tons | -- | -- | 153 | 2,722 |
| Chromium: | | | | |
| Ore | -- | -- | 263 | -- |
| Metal tons | -- | -- | -- | 218 |
| Nickel: | | | | |
| Metal | -- | -- | -- | 14 |
| Ferronickel | -- | -- | -- | 67 |
| Molybdenum: | | | | |
| Ore tons | -- | -- | 75 | 3,811 |
| Ferromolybdenum do | -- | -- | -- | 3,343 |
| Vanadium compounds do | -- | -- | 690 | -- |
| Tungsten ore do | 2 | -- | 862 | -- |
| Ferrocolumbium do | -- | -- | -- | 526 |
| Cobalt metal do | -- | -- | -- | 226 |
| Aluminum, unwrought do | -- | -- | 656 | 4,770 |
| Nonmetallic: | | | | |
| Quartz and quartzite | -- | -- | 155 | 19 |
| Limestone and dolomite | 110 | 16 | (2) | 89 |
| Lime [4] | 5 | -- | 49 | 344 |
| Refractory brick, etc | 9 | 6 | 3 | 166 |
| Fluorspar | (2) | -- | (2) | 12 |
| Oxygen: | | | | |
| Liquid tons | 45 | -- | -- | 11,398 |
| Compressed million cubic meters | 70 | -- | -- | 178 |
| Fuels and energy: | | | | |
| Coal | -- | -- | 18 | (2) |
| Coke | 1,608 | 78 | 114 | 5 |
| Fuel oil thousand cubic meters | 99 | 24 | 5 | 206 |
| Electricity million kilowatt-hours | 81 | 75 | 1,169 | 1,786 |

[1] Including pulverized sponge iron.
[2] Less than ½ unit.
[3] Estimated (on basis of table 20 of source publication) to consist about 83% of iron ore and 17% of additives such as mill scale, furnace dust, lime, slag, etc.
[4] Including slaked lime but excluding lime used in production of iron ore sinter and pellets.

**Lead and Zinc.**—In practically all aspects of production, sales, trade, and consumption, 1974 was a year of downward trends. Consumption of refined lead was an exception, which showed a slight 1% advance to 34,000 tons, as reflected in nearly 10,000 tons of imported lead and lead alloys, a 63% increase over 1973. Mine production of lead, in terms of lead content, was 73,700 tons, a 32% drop from 1973, while production of refined lead fell 3% to 45,200 tons. Excess domestic production of lead concentrate continued to be exported for processing; ore exports fell 18% to 47,000 tons. Exports of lead and lead alloys, mostly in unworked condition, decreased 9% to 28,000 tons. Mine production of zinc, expressed as zinc content, declined 4% to 114,000 tons, none of which was smelted in Sweden. Ore exports of 207,000 tons were 8% less than in 1973. Imports of unwrought and wrought zinc and zinc alloys were 2% lower than in 1973, and amounted to 46,000 tons. Exports of corresponding zinc materials at 2,000 tons were down 40%. Slab zinc consumption decreased 8% to 40,000 tons.

Sweden's major producer, Boliden, experienced overall lower results for lead and zinc because sales, in terms of metal content, declined 13% from 1973 amounts for lead materials and 7% for zinc materials. Production of lead ore from the Laisvall

Mine was 1.2 million tons, the same as in 1973. Zinc, in zinc concentrates produced, amounetd to 74,900 tons, which was a 6% decrease from that of 1973 and was attributed to lower zinc content of ore. Production of zinc clinker decreased about 5% to 26,900 tons.

Construction continued at Boliden's Rönnskär works on a Kaldo plant for refining lead-bearing intermediate products from copper and lead production. A new oxygen plant being built was scheduled to begin operating in early 1975. Approval was given for renovations and installations at Laisvall which would increase production capacity by 200,000 tons to 1.4 million tons of ore per year, subject to receiving permission from environmental officials.

At yearend 1974, LKAB acquired all shares in AB Statsgruvor, a state-owned mining company, which has a lead-zinc mine at Stollberg in central Sweden with yearly capacity of 5,000 tons for lead concentrate and 6,000 tons for zinc concentrate.

**Silver.**—Mine production of silver in nonferrous ore declined 4% to 4.5 million troy ounces. Production of silver metal and alloys decreased nearly 5% to 6.0 million troy ounces, of which 4.9 million troy ounces were obtained from domestic ore while the remaining 1.1 million troy ounces were produced on a toll basis. Practically all of Sweden's production of silver was by Boliden, which experienced a 24% drop in sales volume of silver produced from its own material. Boliden announced in 1974 a decision to expand the silver mine at Hällefors. Imports of foreign ore to be used for extracting silver, platinum, and platinum metals dropped substantially in 1974, decreasing to 123 tons from 1,100 tons imported in 1973. For all forms of silver metal and alloys, Sweden's net imports increased 44% in 1974 to 117 tons.

**Tungsten.**—Sweden was a net importer of tungsten materials, producing only about one-fifth of its needs from domestic sources. A major use was for hard metals such as carbides, for which estimated tungsten demand in 1974 was 1,350 tons. An additional 400 tons was estimated to have been consumed in making ferrotungsten. Output of the only tungsten mine, at Yxsjöberg, was equivalent to 268 tons, metal content, down about one-fifth from that of 1973. Net imports of ore decreased 19% from 1973 levels, to 1,876 tons in 1974. In 1974, exports exceeded imports by 54 tons for all forms of tungsten, opposite to 1973 when imports of tungsten were 82 tons more than exports.

AB Statsgruvor, operator of the Yxsjöberg mine, was acquired by the state-owned mining company LKAB as of January 1, 1974. The Cemented Carbide Div. of Sandvik AB started a new line at its Coromant factory for producing tungstic oxide from wolframite and scrap-cemented carbide as a way of reducing dependence on scheelite, and increased furnace capacity for making tungstic oxide. At the beginning of the year Sandvik became a majority owner of the new company Seco Tools AB, which also manufactures and sells cemented carbides. Seco Tools was formerly a part of Fagersta AB, which then became a minority owner of the new company.

## NONMETALS [13]

**Cement and Other Construction Materials.**—Production in 1974 was 3.3 million tons, about 13% below the level of the last few years, during which there has been a general declining trend. Exports dropped substantially, by 41% from 1973 to 473,000 tons. Imports remained relatively small at 24,000 tons, 11% below that of 1973. Cementa AB, a division of the Euroc Group, continued as Sweden's sole cement producer.

Gypsum imports declined again, falling 9% to 428,000 tons. The Chemicals Div. of Boliden continued commercial trials on replacement of natural gypsum with by-product gypsum, and began making regular deliveries to the cement industry.

**Feldspar.**—Production came almost completely under State control at yearend 1974 when state-owned LKAB increased its holdings from 67% to 90% in AB Forshammars Bergverk, Sweden's only feldspar producer. In April, a private prospector discovered a large deposit of feldspar at Hällsjön in central Sweden. The deposit was close to the surface and promised to be the largest single deposit in the country. The claim, which contained material suitable for ceramic applications, was under investigation by Statsgruvor.

**Fertilizer Materials.**—Volume of crude

[13] For a review of this commodity area in Sweden see Industrial Minerals, No. 87, December 1974, pp. 7–35.

phosphate imports increased moderately by 11% to 696,000 tons in 1974. Substantial raw material price increases occurred, as value of imports more than tripled compared with 1973. Boliden reported that the price of phosphorous raw materials rose 400%, although the effect of this increase on the company was largely offset by increases in product prices also. Supra AB, a Boliden subsidiary which accounts for virtually all of Sweden's fertilizer production, increased its output by 5% to 1.3 million tons. Because of sharp rises in raw material costs, Supra increased fertilizer prices by 70%; in September prices were frozen by government action. Imports of potassium salts and manufactured fertilizers in 1974 declined less than 1% to 854,000 tons. Exports of phosphate fertilizer rebounded strongly, more than doubling to 173,000 tons.

Production of phosphoric acid by the Chemicals Div. of Boliden increased by 11% to 106,000 tons. Output of the company's new acid plant at Helsingborg increased significantly in spite of continuing operating problems. LKAB planned to make a $38 million installation at Vitåfors near Malmberget to convert apatite separated from iron ore to monoammonium phosphate. The operation would annually yield about 190,000 tons of phosphate from the processing of 250,000 tons of apatite. Apatite concentrate containing 17% phosphorous from the Gränges iron ore mine at Grängesberg is already in use for making fertilizer.

Project engineering continued at Supra on a multination plan for an ammonia plant in Scotland. Supra acquired 50% ownership of Reci Industri AB in Sweden. Reci collects waste oil from which Supra makes ammonia at Kvarntorp. Imports of nitrogenous fertilizers grew 7% to 545,000 tons.

**Fluorine.**—Production of acid and metallurgical-grade fluorspar dropped by nearly 12% in 1974 to 4,000 tons; fluorspar imports fell by about 9% to 14,400 tons. Consumption of selected fluorine materials in 1973, in the basic metal industries, was 11,000 tons of fluorspar and 2,200 tons of hydrofluoric acid, 10% and 20% increases respectively, over those of 1972.

**Sulfur.**—Boliden, which accounts for nearly 90% of Sweden's output, produced 826,000 tons of sulfuric acid in 1974, a negligible increase over 1973. Most of this acid, 663,000 tons, was produced at Helsingborg from pyrites, the balance of 163,000 tons being obtained from smelter gases at Rönnskär. Boliden also manufactured 55,000 tons of liquid sulfur dioxide, 24,500 tons of which came from the Helsingborg plant and 31,000 tons of which were from the Rönnskär smelter. For these materials, origins and amounts obtained were little different than in 1973.

Exports of sulfuric acid dropped precipitously to 73,000 tons, only about one-fourth that of a year earlier. Imports of sulfuric acid decreased 11% to 100,000 tons; however, imports of crude sulfur grew 29% to 130,000 tons.

## MINERAL FUELS

**Energy Balance.**—Hydropower was the only major energy source domestically available in quantity. Some expansion of hydropower is possible, subject however to legislative and environmental constraints. Energy from imported fossil fuels supplied the majority of Sweden's energy demand, as shown in table 5.[14]

[14] The Swedish Institute (Stockholm). Energy Supply in Sweden FS 37, June 1974, 4 pp.

Table 5.—Energy balance in Sweden, 1973

| Energy | Quantity ($10^9$ kilowatt hours) | Percent of grand total |
|---|---|---|
| SUPPLY | | |
| Indigenous energy: | | |
| Hydropower | 70 | 14 |
| Waste | 31 | 6 |
| Wood | 8 | 2 |
| Total | 109 | 22 |
| Imported primary energy: | | |
| Crude oil | 125 | 25 |
| Coal | 8 | 2 |
| Uranium | 7 | 1 |
| Total | 140 | 28 |
| Imported processed energy: | | |
| Electric power | 6 | 1 |
| Gasoline and kerosine | 41 | 8 |
| Fuel oil | 189 | 38 |
| Coke | 12 | 3 |
| Total | 248 | 50 |
| Grand total | 497 | 100 |
| CONSUMPTION | | |
| Utilized: | | |
| Industrial | 131 | 26 |
| Transportation | 13 | 3 |
| Domestic and commercial | 109 | 22 |
| Total | 253 | 51 |
| Exports | 34 | 7 |
| Losses (primary conversion, transmission, end consumption) | 210 | 42 |
| Grand total | 497 | 100 |

**Energy.**—*Electric.*—According to preliminary figures, production of electricity in 1974 totaled 75.13 billion kilowatt-hours, 4% less than in 1973. Of the total production, hydroelectric plants provided 76%, conventional thermoelectric plants 21%, and nuclear powerplants 3%, virtually the same distribution as in 1973. In 1974 SKB continued construction on a 28-megawatt hydroelectric powerstation at Kvarnsveden to be completed in 1975. Total generating capacity installed in Sweden at yearend was 23,842 megavolt amperes, of which 58% was hydroelectric, 37% conventional thermal and 5% nuclear.

Consumption of electricity in 1974 was distributed as follows: Mining, quarrying, and transportation, 51%; households and commerce, 35%; transmission losses 10%; land transport, 3%; and gas, steam, and water supply, 1%. Fuel consumption in generating electricity in 1974 [15] is shown in the following tabulation:

| Energy Source | Amount used, thousand tons oil equivalent |
|---|---|
| Fuel oils | 2,611 |
| Uranium dioxide | 536 |
| Coal | 39 |
| Blast furnace and coke oven gas | 34 |
| Lye | 26 |
| Trash | 22 |
| Wood waste | 20 |
| Gasoline, kerosine, and diesel oil | 3 |
| Total [1] | 3,292 |

[1] Data may not add to total shown because of independent rounding.

*Nuclear.*—Sweden's first nuclear power reactor at Agesta outside Stockholm was closed in July 1974 for economic reasons and not because of lagging interest in nuclear power. On the contrary, nuclear energy

[15] Statistiska Centralbyrån (Stockholm). Elstatistik för År 1974 (Electric Energy Statistics 1974). Statistiska Meddelanden. Nr. I 1975:29, June 9, 1975, p. 3.

research and development continued as a priority item of energy research. Developments in Sweden were even described as possibly leading to fashioning of a complete fuel cycle.[16]

Connection of the second nuclear power unit at Oskarshamn to the national network in October brought the total installed capacity of that station to 1,100 megawatts. Bringing into operation two nuclear units at Ringhals, one a boiling-water reactor by Asea-Atom and the other a pressurized-water reactor by Westinghouse, will raise the country's installed nuclear generating capacity to 2,260 megawatts. Construction underway on two nuclear units at Forsmark will add another 1,800 megawatts. Other units licensed will increase Sweden's nuclear generating capacity to about 5,500 megawatts by 1980. The rate of expansion beyond that depends on parliamentary action.

In February the Swedish Nuclear Fuel Supply Co. signed a uranium enrichment contract with the U.S.S.R.'s Teknabexport. The Soviet Union is to deliver 300 separative work unit (SWU) tons of enriched uranium in 1979 and 1980 from uranium ore to be provided by Sweden, and there is an option for further enrichment services to 1989. Since Sweden has its uranium supply secured until 1996 by agreement with the United States, Soviet enriched uranium constitutes a reserve. Sweden decided against participation in the French-initiated European consortium, which is to construct a gaseous diffusion uranium enrichment plant in France. In December, the Swedish Nuclear Power Inspectorate signed an agreement with the U.S. Nuclear Regulatory Commission for cooperation in regulation of safe operation of nuclear powerplants.

LKB undertook further studies with AB Atomenergi and the State Power Board on extraction of uranium at Ranstad. Production of 1,275 tons of uranium from 6 million tons of shale, beginning in 1980 at the earliest, was to be surveyed. The Atomic Energy Co. began planning a central plant at Studsvik for treatment and storage of low and moderately radioactive waste. The plant is to handle 900 tons of waste per year by burning it and baking the residue into asphalt or concrete blocks for storage in a special guarded building. With commencement of operations in 1976, the plant will be able to handle wastes from hospitals, universities, industry, and nuclear powerplants up to 1980.

**Coal and Coke.**—Imports of solid fuels in 1974 included 1.5 million tons of coal, 1.6 million tons of coke, and 13,000 tons of lignite. Coal, coke, and lignite were all imported in larger quantities than in 1973, the increases amounting to 48%, 7% and 30%, respectively. The decision to proceed with the "Steelworks 80" project of NJA is expected to raise coking coal requirements to 4 million tons per year. It is anticipated that the additional requirements will be met by imports from Poland, the Soviet Union, Australia, and the United States.

The pattern of consumption of purchased coal and coke by mining and primary metal industries in 1974 in tons, was as follows:

| | Coal | Coke |
|---|---|---|
| Iron ore mines | 73,643 | 88,742 |
| Iron and steel works | 224 | 1,694,303 |
| Ferroalloy works | 17,571 | 114,496 |
| Other iron-manufacturing | 16 | 3,354 |
| Nonferrous metal smelters | 61,113 | 2,232 |
| Lime manufacturing | 6,756 | 21,598 |
| Other mines, quarries, etc. | 80 | 6 |
| Total | 159,403 | 1,924,731 |

**Petroleum.**—Sweden, dependent on imported oil and petroleum products for 70% or more of its energy, experienced problems during the fuel crisis of 1973–74 similar to those of other developed nations. A few weeks of gasoline rationing in January 1974, ending with a dramatic increase in gasoline price to spur conservation, was ultimately followed by a marketing price war in the summer. Government actions to combat future crises included joining the International Energy Agency and imposing a surtax on gasoline and fuel oil for 3 years beginning July 1, 1974, to finance a 3-million-cubic-meter stockpile of crude oil.

The partly government-owned prospecting company, Oljeprospektering AB (OPAB), continued seeking oil on Gotland Island and in adjoining Baltic Sea waters, so far without notable success. The possibility of oil finds in the area apparently led to difficulty in setting Continental Shelf boundaries between Sweden and both the Soviet Union and Poland. Petroswede AB,

[16] The Financial Times. Sweden. Growing Opposition to Nuclear Expansion. No. 26,406, July 8, 1974, p. 19.

50% government-owned, made an agreement with Egyptian General Petroleum Corporation for joint exploration in Egypt's Natroun valley.[17]

Trade, refining, and consumption of oil and petroleum products all fell in 1974. Crude oil imports, falling since 1971, declined 5% to 10.05 million tons. For petroleum products, imports at 19.15 million tons were down 3% and exports decreased about 7% to 1.3 million tons. Refinery throughput of crude oil and feedstocks was 11.26 million tons, off 3%. Inland consumption of petroleum products was reported to have dropped 10% as follows, in thousand tons:

| Product | 1973 | 1974 |
|---|---|---|
| Gasoline | 3,163 | 2,912 |
| Kerosine | 138 | 88 |
| Gas/diesel oil | 9,487 | 7,872 |
| Residual fuel oil | 12,314 | 11,541 |
| Other | 1,875 | 1,848 |
| Total | 26,977 | 24,261 |

Source: Organization for Economic Cooperation and Development (Paris). Provisional Oil Statistics by Quarters, 4th Quarter 1974, 21 pp.

Government and industry both showed interest in expanding Sweden's refining capacity above the 20-million-ton-per-year capacity to be reached with completion of the Scanraff project. The Scanraff refinery at Lysekil on the west coast is a joint effort between Texaco Inc. and Oljekonsumenternas Förbund, a Swedish cooperative. This plant represents the largest single U.S. investment in Sweden. The first crude oil cargo was discharged in November 1974. The refinery was designed to process at least 8.3 million tons of crude oil annually, largely to be obtained from the Arabian American Oil Company (Aramco) in the Persian Gulf. The refinery is equipped to produce mainly fuel oils containing not more than 1% sulfur. Desulfurization will result in production of about 50,000 tons per year of byproduct sulfur expected to be consumed mostly within Sweden.

[17] World Petroleum Report 1975. Mona Palmer Publishing Co., Inc., New York, p. 83.

# The Mineral Industry of Taiwan

By K. P. Wang [1]

Taiwan's importation and processing activities in minerals and metals overshadow indigenous extraction. A comparison of output values show that the mineral processing sector outweighed the mining sector by 14 to 1 in 1974. The mineral processing sector accounted for 27% of the 1974 estimated gross national product (GNP) compared with 2% for the mining sector. Breakdown by value of output for specific mineral-related sectors, in million U.S. dollars,[2] is as follows:

| Sector | 1973 | 1974 |
|---|---|---|
| Overall mining | 118 | 288 |
| Coal | 48 | 129 |
| Metals | 18 | 29 |
| Oil and natural gas | 28 | 102 |
| Salt evaporation | 3 | 4 |
| Nonmetals and quarrying | 26 | 24 |
| Manufacturing of mineral and related products | 1,839 | 3,871 |
| Chemical products | 695 | 1,786 |
| Oil and coal products | 411 | 930 |
| Nonmetallic mineral products | 227 | 364 |
| Basic metals | 428 | 651 |
| Metal products | 78 | 140 |

Estimated GNP for 1974 was $14.1 billion at current prices and $8.7 billion at 1971 prices compared with $10.2 billion and $8.6 billion, respectively, for 1973. Industrial production was 30% of the net domestic product and agricultural production 13%. In absolute values, GNP growth was minimal and this was generally true of the mineral and related industries also. Like in many countries, the economic dislocation was great, with overall prices going up about 50% in a year while prices for oil and some other raw materials increased severalfold. Taiwan tried to control inflation, however, by permitting prices to initially rise to high levels and then pegging them at these levels indefinitely. This allowed enterprise to plan ahead while continuing to produce.

Taiwan's relatively meager mineral reserves have been recently reported as follows,[3] in thousands of tons: Coal, 226,000; marble, 300,000; dolomite, 120,000; glass sand, 82,000; asbestos, 80; gold ore, 7,500; copper ore, 16,000; talc, 2,500; pyrites, 1,900; magnetite, 200; manganese, 100; ilmenite, 45; zircon, 25; monazite, 90; and sulfur, 2,500. Natural gas reserves have been estimated at 32 million cubic meters (1.1 billion cubic feet), and proven petroleum reserves onshore, 3.5 million kiloliters (22 million barrels).

Taiwan's major governmental industrial projects were mainly under the Ministry of Economic Affairs (MEA) with some under provincial jurisdiction. There are a number of important government or quasi-government corporations, such as China Petroleum Corp. (CPC), Taiwan Aluminum Corp. (TALCO), China Iron and Steel Corp., Ltd. (China Steel), Taiwan Metal Mining Corp. (TMMC), Taiwan Fertilizer Co. (TFC), and Taiwan Ship-

[1] Supervisory physical scientist, Division of Nonmetallic Minerals.

[2] Where necessary, values have been converted from New Taiwan dollars (NT$) to U.S. dollars at the rate of NT$38=US$1.00.

[3] Far East Economist Review (Hong Kong). Aug. 1, 1975, pp. 34–35.

building Corp. The coal and cement industries have been essentially turned over to private enterprises. Within MEA, there is a Department of Mines, a small organization dealing with policy and administrative matters. The Department of Mines started to look into the matter of expanding the provincial Taiwan Geological Survey into a full-fledged modern Survey under the central government. The Mining Research Service Organization (MRSO) in Taipei and the Metal Industries Research Institute in Kaohsiung are now major components of the newly formed Institute of Industrial Technology aimed at providing technical support to Taiwan's mineral and related industries. MRSO does important work in resource evaluation, mining and beneficiation consultation, and energy investigations.

Despite the oil and economic crises and the nearly zero industrial economic growth in 1974, Taiwan was moving ahead with almost all of its 10 big industrial projects.[4] For fiscal 1975, the Government budgeted $1,255 million out of a total of $2,934 million for these projects. During the first half of 1974, 42 miles of the 235-mile North-South Freeway was completed. Three contracts totaling $167 million were signed in the spring of 1974 for electrification of the west coast mainline railroad from Keelung to Kaohsiung. Construction of the Suao-Hualien railroad through rugged mountains in the east was finally started on Christmas day 1973. Construction began on a new Taipei International Airport near Taoyuan in mid-1974, to be completed in three phases—1980, 1990, and 2000. In a project concerning powerplants, Taiwan will simultaneously work on nuclear, water, and thermal powerplants. Taiwan was moving ahead on developing the petrochemical industry, including building four naphtha crackers. China Steel was working towards implementation of the first phase of its Kaohsiung project calling for 1.5 million tons of crude steel by 1978. A new large shipyard for constructing 450,000-ton tankers ran into trouble, because of the large surplus of tanker capacity worldwide; this project no doubt will be modified. When the first phase of construction is completed in 1976, the new Taichung port is expected to accommodate 3 million tons of shipping per year. The Suao port, auxiliary for Keelung, will be expanded; work in 1974 consisted of dredging to deepen the Suao channel from 6 to 7.5 meters.

Taiwan's output of electric power was about 20.5 billion kilowatt-hours in 1974, 3.5% higher than that of 1973. The bulk of the power was produced by the Taiwan Power Co. (TPC). Taiwan Power's installed capacity was 4.1 million kilowatts in April 1974, and about 4.7 million kilowatts at yearend 1974. Projects underway would increase capacity further to about 6.5 million kilowatts by yearend 1976.

As of April 1974, Taiwan's 29 hydroelectric plants had a combined capacity of nearly 1.2 million kilowatts. A long-term project at Sun Moon Lake would add nearly 1.5 million kilowatts. By yearend, Tachia River in central Taiwan was expected to have the following capacity: The already installed 360,000-kilowatt Chingshan plant (Taiwan's largest); the 234,000-kilowatt Techi plant; the 180,000-kilowatt Kukuan plant; and the 79,000-kilowatt Tienlun plant. A 1.85-million-kilowatt thermal plant at Taling near Kaohsiung is to be completed in mid-1975. Construction of the first nuclear plant was well underway in northern Taiwan; startup of one unit of 636,000 kilowatts was expected by October 1976. All told, Taiwan hopes to have 7.8 million kilowatts (eight generators at three plants) of nuclear capacity by 1985. In view of the difficulties encountered by nuclear plants worldwide, however, plans could very well be delayed or modified.

Taiwan's industries consumed 13.75 billion kilowatt-hours of electricity in 1974, including 6.6 billion kilowatt-hours in the minerals and related fields. Estimated breakdown within the minerals and related industries was as follows, in million kilowatt-hours: Iron and steel, 1,387; basic industrial chemicals, 1,132; cement, 762; chemical fertilizers, 536; aluminum, 352; other chemical products, 1,645; mining and quarrying, 317; metal products, 325; and ceramics, 150.

## PRODUCTION

Coal output declined another 12%, whereas crude oil and natural gas gained 25% and 9%, respectively. Neither oil nor gas production was of consequence by

[4] China Publishing Co. Taiwan's Ten Big Projects. July 1974, pp. 1–24.

world standards, but the latter was important to the domestic economy. The real significance of oil was in the production and consumption of refinery products derived from imported crude, which far overshadowed domestic crude in overall oil supply. Overall production of petroleum products declined somewhat.

Steel ingot output increased by 12%. Aluminum production showed a drop of 11% because of electric power and high raw material cost difficulties, among other things. Mine copper output showed little change, but refined copper output increased 48% with the expansion of the refinery.

Overall output in chemical fertilizers showed a great change with rises in some items and declines in others. Salt production declined slightly, but a new plant was brought in. Increased domestic demand for cement absorbed the 4% growth in output. The marble industry was running into difficulties, because of the need to further modernize.

**Table 1.—Taiwan: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Alumina, gross weight | 52,602 | 70,000 | e 70,000 |
| Metal, primary | 32,104 | 35,111 | 31,320 |
| Sheet | 16,593 | 20,822 | 16,426 |
| Copper: | | | |
| Mine output, metal content e | r 2,500 | r 2,400 | 2,500 |
| Metal, refined, secondary | r 4,769 | 6,649 | 9,859 |
| Gold metal, primary troy ounces | 17,882 | 22,197 | 22,850 |
| Iron and steel: | | | |
| Iron ore and concentrate | 28,291 | 24,000 | e 25,000 |
| Pig iron | r 128,104 | 149,954 | 111,143 |
| Ferroalloys (ferrosilicon) | r 10,806 | 13,400 | 27,180 |
| Crude steel | r 470,280 | 507,474 | 563,183 |
| Silver metal, primary thousand troy ounces | 74 | 93 | 83 |
| **NONMETALS** | | | |
| Asbestos | 2,687 | 5,308 | 3,596 |
| Cement, hydraulic thousand tons | r 5,869 | 6,096 | 6,171 |
| Fertilizer materials, manufactured: | | | |
| Urea (46% N) do | 201 | 180 | 178 |
| Ammonium sulfate (21% N) do | r 395 | 529 | 482 |
| Ammonia, anhydrous do | 159 | 145 | 349 |
| Nitrochalk (20% N) do | 11 | 23 | 37 |
| Compound fertilizer (20% N, 5% $P_2O_5$, 10% $K_2O$) do | r 220 | 216 | 190 |
| Calcium superphospate (18% $P_2O_5$) do | 205 | 201 | 234 |
| Gypsum: | | | |
| Precipitated | r 2,430 | 1,470 | 1,354 |
| Other | 3,459 | 3,534 | 2,621 |
| Lime thousand tons | r 196 | 176 | 155 |
| Pyrite and pyrrhotite (including cupreous): [1] | | | |
| Gross weight | r 30,871 | 11,216 | 10,452 |
| Sulfur content e | r 11,731 | r 4,262 | 3,972 |
| Salt, marine thousand tons | 440 | 381 | 363 |
| Stone: | | | |
| Dolomite do | 98 | 126 | 122 |
| Limestone do | r 8,433 | 8,756 | 8,956 |
| Marble do | 1,773 | 1,069 | ([2]) |
| Sulfur, elemental, native other than Frasch [3] | 3,663 | 5,595 | 3,310 |
| Talc and related materials, soapstone | 24,792 | 23,124 | 13,517 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Carbon black | 197 | e 200 | e 200 |
| Coal, bituminous thousand tons | 3,913 | 3,327 | 2,934 |
| Coke do | 249 | 218 | 187 |
| Gas, natural: [4] | | | |
| Gross production million cubic feet | 44,632 | 51,358 | 56,034 |
| Marketed do | 44,186 | 50,548 | 52,707 |
| Natural gas liquids: | | | |
| Condensate thousand 42-gallon barrels | 910 | -- | -- |
| Liquefied petroleum gas from natural gas do | 614 | 687 | 931 |
| Natural gasoline do | 163 | 201 | 194 |
| Petroleum: | | | |
| Crude do | 910 | 1,055 | 1,321 |

See footnotes at end of table.

Table 1.—Taiwan: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Petroleum—Continued | | | | |
| Refinery products: | | | | |
| Gasoline | thousand 42 gallon barrels | r 6,550 | 7,905 | 6,953 |
| Jet fuel | do | 6,866 | 7,906 | 3,750 |
| Kerosine | do | 258 | 204 | 152 |
| Distillate fuel oil | do | r 9,083 | 11,181 | 10,367 |
| Residual fuel oil | do | r 23,938 | 30,319 | 28,782 |
| Liquefied petroleum gas | do | r 2,378 | 2,795 | 1,912 |
| Asphalt | do | r 948 | 1,050 | 943 |
| Lubricants | do | r 2 | 449 | 499 |
| Other | do | r 1,371 | 1,481 | 340 |
| Fuel and losses | do | 1,629 | 1,868 | 2,891 |
| Total | do | r 53,023 | 65,158 | 56,589 |

e Estimate. p Preliminary. r Revised.
1 From Chinkuashih only.
2 Only reported volumetrically at 378,076 cubic meters.
3 Excludes sulfur produced by oil refineries.
4 Mainly processed into natural gas liquids.

## TRADE

Taiwan's trade continued at high levels, despite severe economic difficulties during 1974. Taiwan fared better than most of the other 20 major world trading nations. Two-way trade reached $12.61 billion up more than 50% from the previous year. Exports increased from $4.48 billion in 1973 to $5.64 billion in 1974 and imports increased from $3.79 billion to $6.97 billion. Measured in real terms (comparable 1973 prices), however, imports and exports both declined slightly. The largest import items were general machinery, petroleum products, electrical machinery, iron and steel products, transportation equipment, and chemicals and fertilizers. Industrial products represented 85% of all exports. Textiles with electrical machinery, wood products, general machinery, and metal products lead the way in that order. Japan and the United States remained the leading trading partners.

In 1974 mineral and metal products represented 3% to 4% of all exports and possibly 15% of all imports, reflecting Taiwan's reliance on imported raw materials and semimanufactures. During the year, mineral exports increased to possibly $250 million, mainly on account of increased exports of metal products. Mineral imports showed a twofold gain in value (about $1.81 billion in 1974), accountable mainly by higher prices, a one-third tonnage increase in iron and steel imports, and a more than doubling in the volume of petroleum imports. Table 2 shows the principal mineral categories traded during the last 3 years and table 3 indicates specifically the tonnage and value of major mineral products imported in 1974.

Table 2.—Value of principal mineral exports and imports by Taiwan
(Million New Taiwan dollars (NT$)) 1

| Commodity | 1972 | 1973 | 1974 |
|---|---|---|---|
| EXPORTS | | | |
| Iron and steel products | 3,137 | 2,218 | 4,241 |
| Nonferrous metals | 805 | 772 | 895 |
| Cement and products | 555 | 312 | 462 |
| Glass products | 549 | 739 | 951 |
| Refined oil products | 498 | 707 | 1,015 |
| Bunkering oil | 1,000 | 1,100 | NA |
| IMPORTS | | | |
| Iron and steel products | 6,891 | 11,333 | 23,981 |
| Scrap iron | 1,050 | 2,023 | 3,830 |
| Iron ore | NA | 76 | 130 |
| Nonferrous metals | 2,697 | 3,760 | 5,583 |
| Bauxite | 55 | NA | 108 |
| Copper ore, concentrates, and matte | NA | NA | 230 |
| Asbestos | NA | 111 | 158 |
| Chemical fertilizers | 176 | 286 | 1,470 |
| Phosphate rock | 125 | 122 | 556 |
| Sulfur | 132 | 110 | 411 |
| Crude oil | 6,871 | 3,784 | 27,257 |
| Refined petroleum 2 | 1,288 | 1,637 | 5,080 |

NA Not available.
1 NT$38=US$1.00.
2 Mainly fuel oil and secondarily, lubricating oil.
Source: Industry of Free China (Taipei, Taiwan). V. 43, No. 6, June 1975, pp. 84–151.

Table 3.—Taiwan: Specific mineral and metal imports, 1974 [1]

| Commodity | Quantity (metric tons) | Value (million NT$) | Principal sources (metric tons) |
|---|---|---|---|
| Metal ores and scrap: | | | |
| Iron and steel scrap | 785,962 | 3,830 | United States 589,957. |
| Nonferrous scrap | 23,124 | 320 | NA. |
| Copper ore, concentrate, and matte | 12,743 | 230 | Philippines 8,900; Mexico 3,793. |
| Iron ore | 143,862 | 130 | India 123,972. |
| Bauxite | 105,609 | 108 | Malaysia 55,968; Australia 41,011. |
| Manganese ore | 28,885 | 74 | Republic of South Africa 11,055; Australia 6,753. |
| Chromite | 21,173 | 26 | India 10,000; Malaysia 9,234. |
| Radio-active ores | 13 | 24 | Mainly from United Kingdom. |
| Nonmetallics: | | | |
| Phosphate rock | 251,340 | 556 | Jordan 116,000; Israel 67,000. |
| Salt | 509,312 | 340 | Australia 455,555. |
| Sulfur | 208,848 | NA | Canada 148,389. |
| Asbestos | 16,348 | 158 | Republic of South Africa 11,483. |
| Gypsum | 101,249 | 98 | Thailand 30,543; Australia 29,419. |
| Abrasives | 4,361 | 54 | Mainly from Japan. |
| Kaolin | 30,219 | 53 | Hong Kong 8,731; Republic of Korea 8,650. |
| Fire clay | 8,980 | 28 | Japan 3,444. |
| Graphite | 7,471 | 21 | Republic of Korea 7,370. |
| Bentonite | 8,551 | 18 | United States 2,508. |
| Steatite | 2,454 | 10 | Republic of Korea 1,934. |
| Fuels and fertilizers: | | | |
| Crude oil | 13,740,153 | 27,257 | Saudi Arabia 6,268,372; Kuwait 6,010,955. |
| Refined petroleum | 1,981,041 | 5,080 | Mainly from Kuwait. |
| Coal | 537,870 | 674 | Australia 423,225. |
| Coke | 99,200 | 228 | Japan 85,205. |
| Chemical fertilizers | 338,551 | 1,470 | Mainly from Japan. |
| Metals: | | | |
| Iron and steel: | | | |
| Steel products (excluding pig iron and ferroalloys) | NA | 21,900 | Do. |
| Ferroalloys | 7,300 | 1,770 | Do. |
| Pig iron | 52,158 | 282 | India 10,084; Finland 7,657. |
| Copper and alloys, unwrought | 19,076 | 1,360 | Japan 12,780. |
| Copper and alloys, worked | 9,216 | 1,060 | Mainly from Japan. |
| Aluminum and alloys, unwrought | 18,337 | 582 | Australia 3,229. |
| Aluminum and alloys, worked | 5,008 | 470 | NA. |
| Zinc and alloys, unwrought | 22,277 | 650 | Argentina 11,313; Canada 4,562. |
| Zinc and alloys, worked | 1,088 | 56 | NA. |
| Tin and alloys, unwrought | 706 | 173 | Malaysia 583. |
| Tin and alloys, worked | 486 | 125 | NA. |
| Nickel and alloys, unwrought | 1,601 | 218 | Canada 702; United States 422; Norway 388. |
| Nickel and alloys, worked | 126 | 32 | NA. |
| Lead and alloys, unwrought | 4,384 | 113 | Australia 3,229. |
| Lead and alloys, worked | 419 | 37 | NA. |
| Platinum | 1.2 | 141 | NA. |
| Silver | 75.7 | 68 | NA. |
| Other | 568 | 51 | NA. |

NA Not available.
[1] Listed in order of values within categories.

Source: Inspectorate General of Customs (Taipei, Taiwan). The Trade of China (Taiwan District) 1974. May 1975.

Table 4.—Taiwan: Exports and reexports of mineral commodities [1]
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Oxide and hydroxide | 720 | [2]687 | Indonesia 430; Republic of Korea 100; Thailand 100. |
| Metal including alloys, all forms | 8,972 | 6,631 | Hong Kong 2,518; Indonesia 1,157; Thailand 729. |
| Copper: | | | |
| Ore and concentrate | 575 | 1,038 | All to Japan. |
| Metal including alloys, all forms | 15,601 | 11,844 | Japan 10,142; Hong Kong 1,350; Thailand 104. |
| Gold metal including alloys troy ounces | NA | 129 | All to Singapore. |

See footnotes at end of table.

Table 4.—Taiwan: Exports and reexports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel metal: | | | |
| Scrap | 59,952 | 8,376 | Japan 6,683; Thailand 520; Indonesia 438. |
| Pig iron, ferroalloys, similar materials | 32,706 | 6,059 | Japan 2,187; Singapore 957; Philippines 739. |
| Steel, primary forms | 37,115 | 890 | Japan 350; Ryukyu Islands 250; Hong Kong 200. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 346,000 | 135,040 | Indonesia 77,707; Saudi Arabia 11,817; Singapore 11,481. |
| Universals, plates, sheets | 35,000 | 5,479 | Jamaica 1,404; Saudi Arabia 1,242; United States 1,238. |
| Tubes, pipes, fittings | (3) | 90,114 | United States 46,070; Puerto Rico 7,844; Indonesia 5,242. |
| Other | 126,000 | 25,171 | Indonesia 9,376; United States 3,111; Japan 2,003. |
| Lead metal including alloys, all forms | 152 | 84 | Japan 61; Indonesia 12; United States 5. |
| Magnesium metal including alloys, all forms | 100 | 134 | All to Japan. |
| Manganese oxide | 100 | -- | |
| Nickel metal including alloys, all forms | 1,178 | 492 | Japan 455; United States 36. |
| Platinum-group metals and silver: | | | |
| Waste and sweepings: | | | |
| Silver, troy ounces | NA | 225 | All to Japan. |
| Other, do | | 193 | All to United Kingdom. |
| Metals including alloys: | | | |
| Platinum group, do | 240,005 | 205,861 | Sweden 120,565; United Kingdom 84,299. |
| Silver, do | NA | 804 | United States 707. |
| Tin metal including alloys, all forms, long tons | 55 | 48 | Singapore 35; Hong Kong 12. |
| Titanium oxides, kilograms | NA | 409 | All to Thailand. |
| Tungsten (wolfram), do | NA | 274 | Philippines 143; Singapore 81; Thailand 27. |
| Zinc: | | | |
| Oxide | 639 | 559 | Philippines 379; Thailand 128. |
| Metal including alloys, all forms | 35 | 5 | Republic of South Africa 1; Spanish Sahara 1; South Vietnam 1. |
| Other base metals including alloys, all forms, n.e.s | NA | 11 | United Kingdom 5; Brazil 4; Japan 2. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 44 | 21 | Malaysia 9; Singapore 8; Thailand 3. |
| Dust and powder of precious and semiprecious stones, kilograms | NA | 498 | All to Japan. |
| Grinding and polishing wheels and stones | NA | 658 | Japan 194; Thailand 149; Hong Kong 124. |
| Asbestos | 5 | 5 | Mainly to Japan. |
| Boric oxide and acid, kilograms | NA | 725 | All to Hong Kong. |
| Cement, thousand tons | 1,081 | 544 | Hong Kong 196; Indonesia 128; Singapore 65. |
| Chalk | 9 | 1 | All to Honduras. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s | 1,751 | 1,955 | Thailand 836; Philippines 420; South Vietnam 130. |
| Products: | | | |
| Refractory (including nonclay bricks) | 21,582 | 10,860 | Philippines 2,237; Ryukyu Islands 2,132; Indonesia 2,209. |
| Nonrefractory | | 20,386 | Hong Kong 7,976; Singapore 7,400; Malaysia 1,491. |
| Diamond: | | | |
| Gem: | | | |
| Not set or strung, thousand carats | NA | 1,100 | NA. |
| Manufactured, do | NA | 35 | NA. |
| Industrial, do | NA | 265 | NA. |
| Diatomite and other infusorial earth | NA | 317 | Japan 100; Philippines 100; Indonesia 62. |
| Feldspar and fluorspar | 120 | 102 | Singapore 44; Japan 38; Philippines 18. |

See footnotes at end of table.

Table 4.—Taiwan: Exports and reexports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials: | | | |
| Manufactured: | | | |
| Nitrogenous | 58,055 | 35,160 | Indonesia 21,200; South Vietnam 13,800. |
| Phosphatic | 19,851 | 12,100 | All to Thailand. |
| Potassic | 2,000 | | |
| Other, including mixed | 143 | 22,463 | South Vietnam 11,262; Indonesia 11,001. |
| Ammonia | 114 | 295 | Malaysia 178; South Vietnam 86. |
| Graphite, natural | 10 | 5 | All to Indonesia. |
| Gypsum and plasters | NA | 94 | Hong Kong 92. |
| Lime | NA | 11,817 | South Vietnam 5,600; Hong Kong 5,192; Pakistan 635. |
| Mica, worked including agglomerated splittings kilograms | NA | 772 | Japan 476; India 246; Philippines 34. |
| Pigments, mineral, iron oxides processed | NA | 20 | All to Malaysia. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural thousand carats | NA | 70,125 | NA. |
| Manufactured do | NA | 28,440 | NA. |
| Salt and brine | 13,693 | 2,500 | All to Hong Kong. |
| Silicon | NA | 54 | NA. |
| Sodium and potassium compounds, n.e.s | 9,512 | 4,056 | Hong Kong 2,131; Indonesia 1,440; Malaysia 300. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | NA | 15,721 | Japan 14,648; Singapore 588; Indonesia 266. |
| Worked | NA | 205,798 | Japan 203,223; Singapore 915; United States 830. |
| Dolomite, chiefly refractory grade | NA | 1,553 | Indonesia 1,060; Philippines 460. |
| Gravel and crushed rock, n.e.s | NA | 30,362 | Japan 28,376; Ryukyu Islands 1,501; Hong Kong 250. |
| Limestone | NA | 512 | Hong Kong 220; Malaysia 200; Singapore 90. |
| Quartz and quartzite kilograms | NA | 69 | Indonesia 35; Japan 18; United States 16. |
| Sand, excluding metal bearing | NA | 640 | Japan 290; Hong Kong 116; Thailand 112. |
| Sulfur: | | | |
| Elemental, all forms | NA | 156 | South Vietnam 70; Indonesia 66. |
| Sulfuric acid, oleum | NA | 32,356 | Japan 31,784; Hong Kong 295; Ryukyu Islands 256. |
| Talc, steatite, soapstone, pyrophyllite | NA | 429 | Indonesia 183; Thailand 181. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 611 | 199 | Indonesia 97; Malaysia 81; Japan 13. |
| Slag, dross and similar waste, not metal bearing | 448 | 228 | Thailand 200; Japan 28. |
| Oxides and hydroxides of magnesium, strontium, barium | NA | 19 | South Vietnam 10; Nigeria 5; Thailand 4. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 3,103 | 2,404 | Dominican Republic 528; Hong Kong 401; Japan 247. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | NA | 179 | Thailand 106; Hong Kong 68. |
| Coal and coke, including briquets | 13,740 | 7,921 | Singapore 2,110; Thailand 2,015; Indonesia 1,471. |
| Hydrogen and other rare gases | NA | 7 | Mainly to Japan. |
| Peat | 7 | -- | |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | -- | 1 | All to United States. |
| Refinery products: [4] | | | |
| Gasoline: | | | |
| Aviation do | r 16 | 26 | NA. |
| Motor do | r 1,035 | 1,702 | |
| Kerosine do | r 90 | 107 | |
| Jet fuel do | r 5,255 | 4,576 | |
| Distillate fuel oil do | r 1,743 | 2,836 | |
| Residual fuel oil do | r 1,556 | 521 | |
| Other do | r 58 | 62 | |
| Total do | r 9,753 | 9,830 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 100,462 | 169,050 | Japan 141,718; Philippines 17,343; United States 4,983. |

r Revised. NA Not available.

[1] Unless otherwise specified, compiled from official Taiwan trade returns, Monthly Statistics of Trade, Republic of China, December 1973, v. 1.

[2] Of which 7 metric tons are artificial corundum.

[3] Included in other.

[4] Source: United States Department of the Interior, Bureau of Mines, International Petroleum Annual 1973, March 1975.

## Table 5.—Taiwan: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum: | | |
| Bauxite and concentrate ---- thousand tons -- | 106 | 9 |
| Oxide and hydroxide | NA | 14,797 |
| Metal including alloys: | 4,012 | 13,225 |
| Scrap | | 14,672 |
| Unwrought | 8,066 | 2,640 |
| Semimanufactures | | |
| Arsenic: | | |
| Natural sulfides | 3 | 19 |
| Trioxide, pentoxide and acids | NA | 468 |
| Chromium: | | |
| Chromite | 4,026 | 26,722 |
| Oxide and hydroxide | NA | 871 |
| Cobalt oxide and hydroxide | 11 | 32 |
| Columbium and tantalum, tantalum metal including alloys, all forms kilograms -- | NA | 51 |
| Copper: | | |
| Ore and concentrate | (1) | -- |
| Matte | NA | 4 |
| Copper sulfate | NA | 66 |
| Metal including alloys, all forms | 28,948 | 30,659 |
| Gold metal, unworked or partly worked ---- thousand troy ounces -- | NA | 250 |
| Iron and steel: | | |
| Ore and concentrate | 82,000 | 132,029 |
| Roasted pyrite | NA | 330 |
| Metal: | | |
| Scrap | 603,000 | 715,761 |
| Pig iron, ferroalloys, similar materials | 16,000 | 71,677 |
| Steel, primary forms | 26,000 | 58,918 |
| Semimanufactures ---- thousand tons -- | 830 | 1,089 |
| Lead: | | |
| Oxides | NA | 1,738 |
| Metal including alloys: | | |
| Scrap | 7,767 | 5,372 |
| Unwrought and semimanufactures | | 6,681 |
| Magnesium metal including alloys, all forms | 73 | 231 |
| Manganese: | | |
| Ore and concentrate | NA | 10,788 |
| Oxides | 3,332 | 2,311 |
| Metal | (2) | 17 |
| Mercury ---- 76-pound flasks -- | 2,273 | 1,686 |
| Molybdenum metal including alloys, all forms | NA | 11 |
| Nickel metal including alloys, all forms | 1,295 | 1,855 |
| Platinum-group metals and silver metal including alloys: | | |
| Platinum group ---- thousand troy ounces -- | NA | 10 |
| Silver ---- do ---- | NA | 1,073 |
| Tin metal including alloys, all forms ---- long tons -- | 934 | 1,255 |
| Titanium oxides | 9,321 | 8,122 |
| Tungsten metal including alloys, all forms | NA | 13 |
| Zinc: | | |
| Oxide and peroxide | 376 | 381 |
| Metal including alloys, all forms | 28,816 | 30,212 |
| Other: | | |
| Ore and concentrate: | | |
| Of molybdenum, tantalum, titanium, vanadium, zirconium ---- | 1,987 | 3,524 |
| Of base metals, n.e.s | | 1,821 |
| Ash and residue containing nonferrous metals | 760 | 1,758 |
| Oxides, hydroxides and peroxides of metals, n.e.s | NA | 1,235 |
| Metals including alloys, all forms: | | |
| Alkali, alkaline earth, rare-earth metals | NA | 53 |
| Pyrophoric alloys ---- kilograms -- | NA | 900 |
| Base metals including alloys, all forms, n.e.s | 3 271 | 164 |
| **NONMETALS** | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | 4,738 | 4,851 |
| Dust and powder of precious and semiprecious stones | NA | 1 |
| Grinding and polishing wheels and stones | NA | 385 |
| Asbestos | 7,175 | 13,096 |
| Barite and witherite | NA | 1,050 |
| Boron materials: | | |
| Crude natural borates | NA | 50 |
| Oxide and acid | NA | 566 |
| Bromine ---- kilograms -- | NA | 1,709 |
| Cement | 4,141 | 3,086 |
| Chalk ---- kilograms -- | NA | 991 |

See footnotes at end of table.

## Table 5.—Taiwan: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| NONMETALS—Continued | | |
| Clays and clay products (including all refractory brick): | | |
| Crude clays, n.e.s.: | | |
| Bentonite | 54,609 | 2,851 |
| Fire clay | | 3,445 |
| Kaolin | | 27,913 |
| Other | | 35,901 |
| Products: | | |
| Refactory (including nonclay bricks) | 4,452 | 5,090 |
| Nonrefractory | | 336 |
| Cryolite and chiolite ---- kilograms | NA | 6 |
| Diamond: | | |
| Gem, not set or strung ---- thousand carats | NA | 105 |
| Industrial: | | |
| Natural ---- do | NA | 1,925 |
| Manufactured ---- do | NA | 200 |
| Diatomite and other infusorial earth | NA | 656 |
| Feldspar and fluorspar | 9,716 | 14,989 |
| Fertilizer materials: | | |
| Crude, phosphatic | NA | 139,547 |
| Manufactured: | | |
| Nitrogenous | 1 | 17,562 |
| Potassic | 111,546 | 127,685 |
| Other, including mixed | 55 | 66,577 |
| Ammonia | 10 | 5,185 |
| Graphite, natural | 4,247 | 4,197 |
| Gypsum and plasters | 142,000 | 126,751 |
| Iodine | NA | 10 |
| Lime | NA | 32 |
| Mica, all forms | 394 | 459 |
| Pigments, mineral: | | |
| Natural, crude | NA | 2 |
| Iron oxides, processed | NA | 2,782 |
| Precious and semiprecious stones, except diamond: | | |
| Natural ---- thousand carats | NA | 86,725 |
| Manufactured ---- do | NA | 17,980 |
| Salt and brine | 17,596 | 66,161 |
| Sodium and potassium compounds, n.e.s.: | | |
| Caustic soda | 1,554 | 15,162 |
| Caustic potash, sodic and potassic peroxides | 406 | 371 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude and partly worked | NA | 310 |
| Worked | NA | 1,101 |
| Dolomite, chiefly refractory grade | NA | 305 |
| Gravel and crushed rock | NA | 235 |
| Quartz and quartzite | NA | 923 |
| Sand, excluding metal bearing | NA | 435 |
| Sulfur: | | |
| Elemental: | | |
| Other than colloidal | 243,000 | 121,917 |
| Colloidal | | 86,858 |
| Sulfur dioxide | NA | 10 |
| Sulfuric acid, oleum | NA | 26 |
| Talc, steatite, soapstone, pyrophyllite | NA | 2,300 |
| Other nonmetals, n.e.s.: | | |
| Crude | 20,381 | 50,374 |
| Slag, dross and similar waste, not metal bearing | 6,989 | 8,594 |
| Oxides and hydroxides of magnesium, strontium, barium | NA | 6,282 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 116 | 107 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Asphalt and bitumen, natural | NA | 95 |
| Carbon black and gas carbon: | | |
| Carbon black | 8,000 | 13,394 |
| Gas carbon | | 13 |
| Coal, all grades, including briquets | [4] 25,000 | 59,145 |
| Coke and semicoke | (5) | 80,320 |
| Hydrogen, rare gases and other nonmetals | NA | 498 |
| Peat, including peat briquets and litter | NA | 20 |
| Petroleum: | | |
| Crude and partly refined ---- thousand 42-gallon barrels | [r] 50,468 | 64,852 |
| Refinery products: | | |
| Residual fuel oil ---- do | [r] 9,921 | 10,916 |
| Lubricants (including grease) ---- do | [r] 325 | 12 |
| Other ---- do | [r] 603 | 1,231 |
| Total ---- do | 10,849 | 12,159 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 132 | 48 |

[r] Revised. NA Not available.
[1] Less than ½ unit.
[2] Included in other base metals.
[3] Includes manganese metal.
[4] Includes coke and semicoke.
[5] Included in coal, all grades.

## COMMODITY REVIEW

### METALS

**Aluminum.**—The government-owned TALCO remained the sole producer of primary aluminum, with little prospect of other producers coming into being in the foreseeable future. Its chemical and reduction facilities at Kaohsiung, rated at 76,000 tons per year of alumina and 38,000 tons per year of aluminum, encountered numerous difficulties during 1974, including power shortages, a nearly doubling of costs and prices, and difficult economic conditions in general. These factors caused a decline in output, a reversal from profit to loss, price disadvantages when compared with imported aluminum, and a slowdown of an expansion program already underway. With the help of the French company Péchiney, the plan was to raise capacity to 140,000 tons of alumina and 70,000 tons of aluminum near the beginning of 1976.

In 1974, Taiwan produced 31,320 tons of primary aluminum ingot (down 3,791 tons from 1973), approximately 3,000 tons of secondary aluminum, 16,426 tons of aluminum sheets, 23,681 tons of aluminum products, and 1,944 tons of aluminum foil. All of the primary aluminum, the bulk of the sheets and plates, all of the foil, and a minor part of the products were produced by TALCO. To improve its financial position, TALCO was considering branching more into fabricated products. In 1974, two small private firms—China Wire & Cable Co. and Walsin Electric Wire & Cable Co.—produced the entire tonnage of secondary aluminum and the bulk of the extrusions, cables and wires, and castings.

Taiwan's 1974 aluminum consumption was estimated at about 60,000 tons, up possibly 20% over that of 1973. Output of products was close to 45,000 tons during the year, and imports during the first half of 1974 exceeded exports by about 9,000 tons. One reason for the high imports was that large tonnages of ingots were purchased, because foreign aluminum was considerably lower in price than Taiwan's quotation of about $0.56 per pound late in 1974. TALCO officials believe that aluminum consumption will continue to grow in areas like building and construction, transportation, electrical goods, containers and packaging, consumer durables, and machinery and equipment.

As usual, Taiwan imported all its bauxite requirements (the island consumed about 125,000 tons in 1974), mainly from two adjoining mines in Johore, Malaysia, and from Australia. The bauxite was converted to alumina, requiring about 16,000 to 18,000 tons of caustic soda. There was no serious effort to consider importing alumina in lieu of bauxite. Power shortages and high power costs have become critical factors in making plans, even though electricity consumption has been cut to about 16,000 kilowatt-hours per ton of aluminum.

**Copper.**—The government-owned TM-MC continued to control most of the copper business in Taiwan. The Chinkwashih mine near Keelung was clearly showing signs of age, with mine copper output declining to about the 2,000-ton per year level. More cement copper was produced, as a result of the introduction of a bacteria-leaching process. Chinkwashih's copper concentrate is only 15% to 20% copper and high in arsenic. Taiwan had trouble selling this to Japanese smelters, and started to refine the concentrate in a newly completed 10,000-ton smelter near the mine site. This smelter, built with some informal Japanese help, may eventually be expanded to 30,000 tons. Even in 1974, most copper raw materials (mainly concentrate and cement copper) came from abroad—mainly from the Philippines and Mexico. Chinkwashih's production of its own byproduct gold increased slightly, because of the rise in world gold prices. Additional gold was derived from imported copper materials. Taiwan's total output of refined copper reached 9,859 tons in 1974, 3,210 tons higher than in 1973.

Copper requirements in Taiwan have been increasing at about 15% yearly. In 1973, Taiwan imported more than 14,000 tons of refined copper and 10,000 tons of copper products. Most likely, imports of these two items were of the same magnitude in 1974; in addition, 6,000 to 8,000 tons of mine copper (copper-in concentrates and matte) were imported to feed the new smelter. Rolling and fabrication facilities are mainly in private hands; one important product is cable and wire which also happen to be significant in exports.

**Iron and Steel.**—Construction of China Steel's integrated steelworks at Kaohsiung

moved ahead towards scheduled completion by early 1978. The USS Engineers and Consultants Inc., a subsidiary of United States Steel Corp., provided technical services and supervision in construction and will eventually also give guidance in the operation of the steelworks during at least the initial stages. USS Engineers had taken over from Vöest Steel Corp. of Austria. By mid-1974, the cost of the project was estimated at $665 million, already more than double the original estimate. In view of continued spiraling costs, the project most likely will top $1 billion before it is completed. China Steel is a quasi-government corporation with 55% of the capital from private investors. A significant part of the funding will come from domestic and foreign loans. Capacity will be 1.5 million tons when production begins in 1978, which could be increased to 6 million tons subsequently. Initial facilities will include: Coke and sinter plants; blast furnace and basic oxygen steel production facilities; continuous casters for the production of billets and slabs; plate and rod and bar mills; plus processing, warehousing, and shipping facilities. The Retired Servicemen's Engineering Agency has been awarded a $4 million contract to build two wharves for the steelworks. By 1978, the steelworks is expected to produce 150,000 tons of pig iron, 245,000 tons of steel ingot, 400,000 tons of steel plate, 300,000 tons of steel wire, and 300,000 tons of steel rods. USS Engineers will be responsible for training both at the plant site and the United States. When the steelworks is in operation, almost all of the iron ore and most of the coking coal will be imported from Australia and elsewhere.

Although Taiwan has produced from 110,000 to 150,000 tons of pig iron annually in recent years, its output of steel products has been closer to 1.5 million tons. Iron ore consumption is relatively small, whereas domestic and imported industrial scrap and ship scrap are the principal iron raw materials. The island's ship scrapping industry is big by world standards. All types of old ships ("live" or "dead") are brought in for scrapping, with special materials, such as, engines, instruments, and equipment salvaged first before cutting up the ships. During 1972–74, an annual average of 1.2 million light displacement tons of imported ships (numbering more than 200) was scrapped and an annual average of possibly 700,000 tons of scrap was imported for consumption.

Local steel product output falls far short of demand, which explains why the decision has been made to build the new steelworks. Imports of iron and steel, including scrap, has risen from 1.50 million tons in 1972 to 1.95 million tons in 1973 (includes 716,000 tons of scrap) and 2.58 million tons in 1974. Because of greatly increased prices, value of steel imports increased from NT$6.9 million in 1972 to NT$11.3 billion in 1973 and NT$24.0 billion in 1974.

Taiwan Iron Manufacturing Corp. and Tang Eng Iron Works led the field of about 160 small steel mills which produce mainly rod and bar, structural sections, and tubes and pipes, in that order. With China Steel getting into the business, Tang Eng Iron Works is shifting into high-priced alloy steels with installation of two new 30-ton electric furnaces. Tang Eng is also looking into a "Midrex" 400,000-ton-per-year direct reduction plant, hoping to use local natural gas.

**Other Metals.**—In 1974, Taiwan produced about 22,900 troy ounces of gold and 32,800 troy ounces of silver. Gold output was slightly higher than the 1973 production, but silver output dropped to not much more than a third of the previous year's level. The Tai Yang Mining Co., with possibly 2 million tons of ore and 300,000 ounces of recoverable gold located at Juifang near Keelung, was about to resume mining under high-price conditions.

Taiwan does not produce any primary zinc, lead, tin, and nickel but consumes sizable tonnages. In 1974, 22,277 tons of unwrought zinc valued at NT$650 million were imported, including 11,313 tons from Argentina, 4,562 tons from Canada, and 2,453 tons from Japan. In addition, 1,446 tons of scrap zinc were also imported, mainly from the United States. Unwrought lead imports totaled 4,384 tons valued at NT$113 million, including 3,229 tons from Australia; scrap lead imports amounted to 3,350 tons valued at NT$25 million, including 1,983 tons from the United States. Tin imports totaled 706 tons (1,250 tons in 1973) valued at NT$173 million, including 583 tons from Malaysia. Nickel imports totaled 1,601 tons (1,748 tons in 1973) valued at NT$218 million, including 702 tons from Canada, 422 tons from

the United States, and 388 tons from Norway. During 1974, Taiwan produced 27,726 tons of galvanized sheet, 42,528 tons of galvanized wire, and 17,621 tons of tin plate.

## NONMETALS

**Cement.**—Taiwan cement output gained 4% over that of 1973 and established a record production of 6,171,366 tons in 1974. However, exports continued to decline from 1,081,000 tons in 1972 to 544,000 tons in 1973 and 346,000 tons in 1974. Hong Kong and Indonesia were the major destinations, with the South Vietnam market virtually eliminated. Prospects for long-term exports were not bright; however, domestic demand continued to rise. Taiwan's cement capacity was about 8 million tons in 1974 and was scheduled to be raised to 11 million tons after 1976. Taiwan has abundant limestone, but western reserves are being exhausted, and huge eastern reserves necessitate construction of new plants near these resources. Taiwan may need 130,000 tons of gypsum per year for cement manufacture, and peak production has been less than one-tenth of this; Mexico has been the leading gypsum supplier to the island.

Taiwan Cement Corp. (TCC), a former government firm turned private, remained by far the largest of the 12 cement companies on the island. Its yearend 1974 capacity of about 3 million tons was in the process of being expanded to 3.8 million tons by mid-1975. TCC has four plants—one each at Kaohsiung, Chutung, Suao, and Hualien. A 200,000-ton kiln at Suao was being replaced by a 500,000-ton unit and a 300,000-ton kiln at Kaohsiung was being replaced by an 800,000-ton unit. Most TCC kilns are of the suspension preheater type and consume coal. Affiliated companies produce cement products, and the Kaohsiung machinery plant makes the equipment needed by TCC. TCC had a good year in 1973, with sales of more than $68 million. Increased sales in 1974 only reflected higher prices. With the spiraling of energy costs, profit margins were drastically cut.

Asia Cement Corp., with a 1.7-million-ton plant at Tahu near Hsinchu, ranked next to TCC; the firm was scheduled to add an 800,000-ton facility by August 1975. During the year, the Chengtai Cement Co. was building a 1,000-ton-per-day four-stage suspension preheater kiln at the Panpingshan plant near Kaohsiung. Both the Chiahsin Cement Co. and the Universal Cement Co. started to build 500,000-ton kilns. A new company—Rebar Cement Co.—made plans to complete an 800,000-ton facility at Suao by 1976.

**Fertilizer Materials.**—The government-owned Taiwan Fertilizer Co. (TFC), the largest of Taiwan's three nitrogen producers, operated four ammonia fertilizer plants with a combined primary capacity of about 390,000 tons per year $NH_3$. TFC will spend $92.7 million to expand facilities.[5] A $73.5 million unit at Miaoli will turn out 186,000 tons per year of urea and 300,000 tons per year of liquid ammonia, with onstream target of July 1977; M. W. Kellogg Co. is the design engineer, and the Export-Import Bank and Chase Manhattan Bank have approved $28 million and $14 million loans, respectively, for the project. At Nankang, TFC will spend $4 million to convert a 54,000-ton-per-year ammonia plant to natural gas use by yearend 1975. Also, at Nankang, a $2 million, 200,000-ton-per-year mixed fertilizer plant is scheduled to be completed at yearend 1975. In the northern part of the country, at Hsinchu, a $13 million, 10,000-ton-per-year melamine plant is expected onstream in mid-1977. TFC already has a 100,000-ton-per-year mixed fertilizer plant at Kaohsiung and was considering building another 350,000 ton-per-year mixed fertilizer plant "in the center of the country" for completion by 1980. The Kaohsiung Ammonium Sulphate Corp. and CPC were the other firms engaged in nitrogen production. CPC has a joint-venture plan with Saudi Arabia to build a large ammonia-urea complex in connection with petrochemicals.

TPC has a phosphoric acid plant in Kaohsiung. However, the China Phosphates Industries Corp., a government enterprise, will be a new source for phosphates when its facility costing $44.5 million is completed in 1976. China Phosphate's goal is to produce 100 tons per day of phosphoric acid, 400 tons per day of sulfuric acid, 90 tons per day of calcium phosphate, 70 tons per day of sodium phosphate, and 400 tons per day of by-product gypsum. Local sulfur might be available from petroleum refineries, but phosphate rock must continue to be imported. During 1974 Taiwan imported 251,340 tons of phosphate rock (139,947

[5] Chemical Week (New York). V. 116, No. 16, Apr. 16, 1975, p. 21.

tons in 1973), mainly from the United States and Jordan.

In 1974 Taiwan produced 481,580 tons of ammonium sulfate (capacity 600,000 tons), 177,530 tons of urea (capacity 300,000 tons), 349,232 tons of anhydrous ammonium, 234,250 tons of calcium superphosphate (capacity 250,000 tons), and 189,764 tons of compound fertilizers (capacity 250,000 tons). The nitrogen comes from the air, but Taiwan virtually has no potash for making compound fertilizers. The Chinese are trying to use as much local natural gas and imported oil as possible to make nitrogenous fertilizers.

**Salt.**—Taiwan's salt output declined from 380,522 tons in 1973 to 362,809 tons in 1974. Consumption continued to increase, mainly in the soda-chlorine industry which produced 89,656 tons of caustic soda (86,583 tons in 1973), 196,426 tons of "liquid soda" (185,584 tons in 1973), and 59,712 tons of soda ash (53,979 tons in 1973). Salt imports reached an unprecedented 509,312 tons, including 455,555 tons from Australia. A $23 million, 100,000-ton-per-year ion-exchange membrane salt plant, furnished by the Japanese firms Marubeni Corporation and Asahi Chemical Industry Co., Ltd. aimed at relieving the salt shortage, was completed near yearend 1974 at Miaoli. The island's salt is all produced by Taiwan Salt Works, a government monopoly.

**Stone.**—*Marble.*—Taiwan's relatively new marble industry, located on the east coast near Hualien, is run mainly by the Retired Servicemen's Engineering Agency. Output reached a peak of 398,558 cubic meters in 1973 but declined to 378,076 cubic meters in 1974. Marble producers were asking for government assistance to modernize near yearend because existing quarrying machinery is outdated. Taiwan's marble reserves are extensive (possibly 300 million tons) and good in quality and variety. Future growth will be in structural marbles, but marble craft was the mainstay of the business in the early development stages. Exports have been increasingly important, mainly to Australia and the United States.

**Other Nonmetals.**—Taiwan's elemental sulfur production was reported at only 3,310 tons compared with 208,848 tons of imports in 1974 (121,917 tons in 1973). However, the quantity of sulfur or sulfuric acid recovered from oil refining is not known but is probably large. Pyrite production, mainly from the Chinkwashih copper mine, was just above 10,000 tons in 1974 or a third of the output in 1972. Talc output declined to 13,517 tons, or to just above half the 1973 level. Most of Taiwan's asbestos requirements are met by imports, primarily from the Republic of South Africa. More than 120,000 tons of dolomite was produced in 1974. Clays were both exported and imported. Taiwan relied totally on imports for mica, graphite, abrasives, and fluorspar. Taiwan Alkali Corp.'s (subsidiary of CPC) 30,000-ton-per-year titania plant was completed in July; it can meet domestic requirements and provide sizable tonnage for export. In 1973 Taiwan produced no titania and imported more than 8,000 tons.

## MINERAL FUELS

**Coal.**—Production continued to decline from 3.913 million tons in 1972 to 3.327 million tons in 1973 and 2.934 million tons in 1974 despite a 1.5-US cents-per-cubic-meter tax on natural gas to subsidize the coal industry. The decrease in 1974 was due in part to sluggish markets and imports of sizable quantities of coal in 1973 to guard against a possible fuel shortage. Meanwhile, coal consumers were converting to other fuels during the period before the oil crisis. Hopefully, coal production will be stabilized at 3 million to 3.5 million tons per year. Wholesale coal prices reached about $30 per ton at yearend 1974, which was low compared with some foreign coals. Basically, the coal industry in Taiwan continued to suffer from resource limitations. As stated, when the new steelworks comes into being, most of the coking coal needed will have to be imported.

**Petroleum.**—Output of indigenous crude oil increased nearly 25%, but this still represented less than 2% of all oil imports. During 1974, Taiwan imported 13.740 million tons of crude oil (to convert to barrels, multiply by roughly 7.3) and 1.981 million tons of refined oil products consisting predominantly of fuel oil (to convert to barrels, multiply by roughly 6.7). Crude oil imports in 1974 were valued at about NT$27.26 billion, and refined oil imports at NT$5.08 billion. In 1973, crude oil imports were only 5.447 million tons valued at NT$5.42 billion.

The severalfold increase in unit price is readily apparent. However, the jump in volume of imports does not mean that consumption rose very sharply but rather that abnormally small amounts were imported in 1973 because in 1972 there was a large imported surplus. Actual consumption in 1973–74 was probably closer to average imports for those 2 years. Taiwan's oil consumption has been rising at a rate of 10% to 15% per year. Most of the crude came from the Middle East, dominated by Saudi Arabia and Kuwait. Kuwait and secondarily Bahrain and Japan were the major suppliers of refined petroleum to Taiwan. The economic relationship with Saudi Arabia has been strengthened since the beginning of the oil crisis. A communique announced early in 1974 indicated that Taiwan and Saudi Arabia would consider joint ventures for building an oil refinery, methyl plant, and urea plant within Taiwan; and Taiwan would furnish technical aid in agriculture, fisheries, powerplant management, and rural electrification within Saudi Arabia.

Taiwan's economy is greatly affected by oil.[6] The island derives 75% of its energy from petroleum, and two of its most important industries—textiles and plastics—depend on it for most of the necessary raw materials. The small petrochemical industry is growing rapidly to supply the intermediates for making plastics and man-made fibers. The company with the primary responsibility of keeping Taiwan's lights burning, its transportation moving, and its factories working is the CPC, a state-owned integrated company that dominates Taiwan's oil and gas economy from the well and tanker to the gas pump. CPC already has six 100,000 deadweight-ton tankers, two buoys (a third buoy for handling 250,000-deadweight-ton tankers is under construction), and 2.5 million hectoliters of storage capacity. With the completion of a new 1 million-hectoliter tank farm, CPC will be able to maintain a 3-month oil reserve for the island.

CPC's total refining capacity, embodied mainly in the Kaohsiung refinery, was about 230,000 barrels per day at yearend 1974 (to convert barrels per day to metric tons per year, multiply by 50). To supply a major petrochemical complex in Kaohsiung, construction of another large refinery was being considered. The company supplies fuel oil to drive the generators of TPC and retails gasoline through a network of more than 250 filling stations plus facilities at airports and harbors.

To supply the petrochemical industry, CPC's first naphtha cracker, with an annual capacity of 54,000 tons of ethylene and 27,000 tons of propylene, has been in operation for 6 years. The second cracker, to be completed in the spring of 1975, will supply 230,000 tons of ethylene, 115,000 tons of propylene, and 35,000 tons of butadiene yearly. Preliminary work on a third and much larger cracker (920,000 tons of ethylene, etc.) has started, but a drop in demand for petrochemicals brought about by the current economic slump will probably cause a considerable delay in construction. Expansion in petrochemicals has made it necessary for CPC to increase its capitalization from $125 million to $210 million. The crackers will supply existing downstream petrochemical plants as well as various planned projects to be built around the crackers with domestic and foreign private capital. There will be at least 20 new downstream projects to produce intermediates like polypropylene (PP), vinyl chloride monomer (VCM), polyethylene (PE), ethylene glycol (EG), styrene, dimethyl terephthalate (DMT), synthetic butadiene rubber (SBR), and acrylonnitrile, etc.

Foreign oil may cost Taiwan nearly $1 billion annually in the near future. To keep expenditures down, Taiwan was shifting some purchases from international oil firms to direct deals with governments of producing nations. CPC was also trying to shift some purchases from the Middle East to places like Indonesia and Brunei. Taiwan was also searching for oil offshore. Little oil has been found onshore, but much natural gas has been found and output reached 1,587 million cubic meters in 1974. CPC plans to spend about $100 million in the next 4 years for exploration—more than half offshore and some in the Philippines and elsewhere.

Six American oil companies are involved in the search for oil offshore. Each has been granted a concession by CPC, which retains a seventh zone for itself. The total area involved is 240,000 square kilometers in the Taiwan Straits, East China Sea, and the Yellow Sea. In the

[6] Modern Asia (Hong Kong). Taiwan Copes With the Oil Crunch. V. 9, No. 2, March 1975, pp. 49–52.

southernmost zone the American Oil Co.–Continental Oil Co. (AMOCO-CONOCO) concession, gas was found at 13,000 feet from one well. CPC would have 25% interest in this and could acquire another 25%. However, it takes 4 or 5 wells to delineate the field and 10 to 20 wells to make the field pay. It costs about $5 million per well, so the future is still most uncertain. Besides, especially for the northern concessions, international jurisdictional problems compound the difficulties. AMOCO began to drill another well (the third, the first being dry) but other concessionaries were taking a wait-and-see attitude.

# The Mineral Industry of Thailand

By David G. Willard [1]

Thailand's mineral industry experienced a relatively prosperous year in 1974, as did the country's economy as a whole; but the future prospects for mineral investment were clouded by the political instability that has affected the business climate since the Kittikachorn Government was overthrown late in 1973. Although physical output of minerals showed mixed results compared with 1973 levels, sharply higher prices boosted the total value of production by 45%. Mineral trade likewise changed little in volume, but total values of mineral exports and imports were up 32% and 55%, respectively.

The most significant event in Thailand's mining industry was the cancellation of tin-mining concessions owned jointly by an American and a Netherlands firm. A large Thai zinc mine was activated with production of approximately 143,000 tons of ore valued at about $8 million during 1974, the first year of operation.

Economic growth slipped to a rate of 3.4% for the year (after adjustment for the effects of price changes) which is considerably below the 13.1% growth rate between 1972 and 1973. However, good agricultural production and a record balance of payments surplus estimated at $400 million [2] contributed to a fairly satisfactory overall financial picture. The rapid rise in prices proved to be a double edged influence, increasing the value of the country's exports of agricultural and mineral products but also raising the cost of its imports, particularly in the case of petroleum products. Other sources of income, chiefly oil concession payments and other transfers and net capital inflow, overcame the deficit on commodity trade. Economic prospects for 1975 are less encouraging. A likely decline in prices for Thailand's commodity exports, continued high petroleum costs, and some reduction in capital inflow and other monetary transfers (including the phasing out of U.S. military activity in the country), all point to a likely balance of payments deficit for 1975. Considering the country's adequate international reserves, however, these need not lead to a serious decline in economic growth.[3]

**Government Policies and Programs.**—Political instability remained the country's number one problem as a badly fragmented parliament provided very little guidance for the Ku rit Government which took office in the spring of 1975. Throughout 1974 the Thai caretaker administration of Prime Minister Sanya Dhammaskti was unable to give a clear indication of future government policy directions. A growing economic nationalism which contributed to the cancellation of tin mining concessions, partly owned by a U.S. company, added a further element of uncertainty.

The tin mining concessions of Thailand Exploration & Mining Co. (TEMCO), jointly owned by Union Carbide Corp. and Royal Dutch Petroleum (Shell) were cancelled by the administration of Prime Minister Seni Pramoj. No other foreign mining concessions were being threatened with revocation.

Controversy over the TEMCO concession stemmed from charges that it was illegally purchased in 1970 from a Thai company whose owners included members of the Thanon-Prapas military government, which was overthrown in 1973. Intense political pressures were mounted against

[1] Economist, Division of Nonmetallic Minerals.

[2] Where necessary, values have been converted from Thai baht (B) to U.S. dollars at the rate B20.375 = U.S.$1.00.

[3] U.S. Embassy, Bangkok, Thailand. State Department Airgram A–111, Apr. 11, 1975.

the concession by students, members of the press, and local government officials and were thought to have pushed the administration into its decision. The owners were considering legal action but were attempting first to arrive at a negotiated settlement. A State mining enterprise was formed to take over the mining operation, and the Government had not yet made any mention of compensation.[4]

The Thailand Smelting and Refining Co., another subsidiary of the same two owners, and operator of the country's lone tin smelter, had not yet been brought into the controversy; nor had a similar attack been mounted against other foreign mining concessions. However, the TEMCO case increased the uncertainty felt by many investors which had already developed during the preceding period of political instability.

Important mineral discoveries reported during the year included five more (for a total of seven) successful oil or gas wells in the Gulf of Thailand and onshore and offshore tin deposits in the Ranong, Phuket, and Yala areas. Possibly more important in the long run were exploration programs to delineate large deposits of potash located in northeast Thailand and extending into Laos, which could help to relieve the shortage of low-cost fertilizer that perenially plagues the country's farmers. However, development of this resource lies some years in the future even if it proves feasible.

A survey report by Underwood, McLellan and Associates, Ltd., to the Thai Government recommended additional public funding for mineral exploration in northern Thailand. The Canadian International Development Agency, sponsor of the study, said that investigations in that area should be expanded to include commodities other than tin and fluorite, the ones on which most previous interest had been focused. Other minerals mentioned as having possibilities for additional development included antimony, lead, manganese, phosphate, and potash.[5]

A $75 million loan for a hydroelectric powerplant was negotiated by the Government of Thailand with the World Bank in April 1974. The loan would pay for 41% of the estimated $181 million cost of the Ban Chao Nen project. Another $45 million was expected to be provided by Japan's Overseas Economic Cooperation Fund. The project, which will be owned by the Electricity Generating Authority of Thailand, includes the dam, a powerplant, and transmission lines serving several parts of the country.[6] Another potential future power development was the Ao Phai nuclear powerplant, a 650-megawatt unit proposed for Chon Buri Province. Initial service was expected to begin in 1981; however, the country's political and economic difficulties appeared to have caused a setback in the planned mid-1974 start of construction.[7]

## PRODUCTION

Production of Thailand's leading minerals showed a mixed record of increases and decreases in 1974. Fluorspar and cement production were both higher than in 1973, while lower output levels were recorded for tin and tungsten. A newly opened zinc mine moved that commodity into the ranks of the country's leading minerals.

Considerably higher prices accounted for most of an estimated 45% increase in the total value of crude mineral production. Estimated total value was $320 million in 1974 and $220 million in 1973. Major contributors to the gain were antimony, tin, tungsten, and zinc—in most cases entirely the result of higher prices—and smaller increments were provided by barite, cement, fluorspar, and feldspar.

Thailand's petroleum refineries produced 13% fewer barrels of refined products in 1974, and the drastic rise in crude oil costs reduced the total value of refinery output below that of the previous year.

[4] Far Eastern Economic Review. Thailand Set for Tin Takeover. V. 188, No. 19, May 9, 1975, p. 56.
[5] Mining Journal. Thailand Survey Report. V. 282, No. 7237, May 3, 1974, p. 355.
[6] Wall Street Journal. World Bank Approves Loan of $75 Million to Thailand for Project. V. 183, No. 67, Apr. 5, 1974, p. 24.
[7] U.S. Embassy, Bangkok, Thailand. State Department Airgram A–253, Sept. 7, 1973, State Department Telegram 952, January 1974.

## Table 1.—Thailand: Production of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Antimony: | | | |
| Ore: | | | |
| Gross weight | 11,172 | 8,033 | 9,965 |
| Metal content | 4,748 | 3,414 | 4,235 |
| Metal | 202 | 199 | 377 |
| Columbite-tantalite concentrates, gross weight | 14 | 24 | 92 |
| Copper, mine output, metal content | [e] 6 | 1 | 2 |
| Iron and steel: | | | |
| Iron ore, 55% iron, gross weight | 27,818 | 36,309 | 36,302 |
| Pig iron | 11,918 | 14,063 | [e] 15,600 |
| Ferroalloys | -- | -- | 8,170 |
| Crude steel | 181,943 | [e] 190,000 | 220,000 |
| Steel billets | 100,800 | [e] 102,000 | [e] 102,000 |
| Lead, mine output, metal content | 1,819 | 3,704 | 1,543 |
| Manganese ore: | | | |
| Battery grade and chemical grade 75% $MnO_2$ | 5,437 | 11,368 | 8,846 |
| Metallurgical grade 46% to 50% $MnO_2$ | 14,415 | 24,950 | 21,343 |
| Total | 19,852 | 36,318 | 30,189 |
| Monazite, gross weight | 171 | 318 | 441 |
| Tin: | | | |
| Mine output, metal content long tons | [r] 21,723 | 20,591 | 20,018 |
| Smelter: | | | |
| Primary do | 21,929 | 22,565 | 19,514 |
| Secondary do | -- | 30 | 9 |
| Tungsten concentrate: | | | |
| Gross weight | 6,485 | 5,048 | 4,276 |
| Metal content | 3,343 | 2,602 | 2,204 |
| Zinc, mine output, metal content | (1) | [r] 66 | 33,500 |
| Zircon, gross weight | 366 | 402 | 2,002 |
| **NONMETALS** | | | |
| Asbestos | 22 | 83 | [e] 100 |
| Barite | 97,091 | 111,930 | 200,917 |
| Cement, hydraulic thousand tons | [r] 3,416 | 3,745 | 3,958 |
| Clays: | | | |
| Ball clay | NA | NA | 28,000 |
| Kaolin | 15,290 | 18,995 | 60,878 |
| Feldspar | 1,500 | 4,510 | 6,998 |
| Fertilizer materials, crude phosphatic | -- | 810 | 5,602 |
| Fluorspar: | | | |
| Crude mine production: | | | |
| High grade | 374,590 | 342,081 | [e] 336,000 |
| Low Grade | 20,480 | 55,924 | [e] 84,200 |
| Total | 395,070 | 398,005 | [e] 420,200 |
| Salable product: | | | |
| Acid grade (beneficiated low grade) | 12,800 | 34,950 | [e] 54,000 |
| Metallurgical grade | 374,590 | 342,081 | [e] 336,000 |
| Total | 387,390 | 377,031 | [e] 390,000 |
| Gypsum | 89,805 | 236,265 | 311,795 |
| Salt [e] thousand tons | 160 | 160 | 160 |
| Sand, silica | 48,080 | 51,450 | 59,640 |
| Stone: | | | |
| Calcite | NA | NA | 50 |
| Dolomite | NA | NA | 400 |
| Limestone thousand tons | NA | NA | 1,836 |
| Marble | NA | NA | 3,645 |
| Marl (used for cement) thousand tons | 372 | 246 | 227 |
| Quartz, not further described | 2,248 | 13,837 | 10,830 |
| Shale | NA | NA | 615,200 |
| Talc and related materials: | | | |
| Pyrophyllite | 1,550 | 9,550 | 1,640 |
| Talc | 75 | 75 | 158 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Coal, lignite thousand tons | 345 | 361 | 485 |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 47 | 45 | [e] 42 |
| Refinery products: | | | |
| Gasoline do | 8,160 | 9,008 | 8,769 |
| Jet fuel do | 4,937 | 4,283 | 4,337 |
| Kerosine do | 1,804 | 1,515 | 1,766 |
| Distillate fuel oil do | 13,474 | 13,753 | 12,305 |
| Residual fuel oil do | 15,753 | 19,470 | 17,438 |

See footnotes at end of table.

Table 1.—Thailand: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| MINERIAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Petroleum—Continued | | | | |
| Refinery products—Continued | | | | |
| Other: | | | | |
| Liquefied petroleum gas | thousand 42-gallon barrels | 1,903 | 2,539 | 2,428 |
| Naphtha | do | 2,072 | 2,466 | 2,062 |
| Asphalt | do | 854 | 7,742 | 498 |
| Unspecified | do | 6,620 | 5,727 | 7,924 |
| Refinery fuel and losses | do | NA | NA | 465 |
| Total | do | 55,577 | 66,503 | 57,992 |

e Estimate. p Preliminary. r Revised. NA Not available.
1 Revised to none.

## TRADE

The trade gap that has been a consistent problem of Thailand's economy grew much wider in 1974. Total exports fell short of total imports by 21%. The trade gap increased by 37% to about $200 million due mainly to growth in the total volume of trade. The largest gap continued to be in trade with Japan, the country's principal trading partner, in which imports exceeded exports by about 17%. However, the greatest widening of the gap occurred in trade with the United States. Exports to the United States rose approximately 22% but imports were up nearly 45%, and the difference between the two increased by 75%. The United States purchased 8% of Thailand's exports and was the supplier of 13% of its imports.[8]

Tin remained Thailand's chief source of mineral income, accounting for 7% of the total value of exports. Other principal mineral exports were precious stones, cement, tungsten, petroleum refinery products, and fluorite. All of these, except petroleum refinery products, showed increases in export value from 1973 to 1974.

[8] Country figures based on data for 10 months.

Table 2.—Thailand: Exports and reexports of mineral commodities [1]
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum metal including alloys, semimanufactures | r 47 | 25 |
| Antimony: | | |
| Ore and concentrate | 5,082 | 6,360 |
| Metal [2] | 64 | 45 |
| Columbite-tantalite [2] | 15 | 44 |
| Copper metal including alloys, all forms | r 60 | 161 |
| Iron and steel: | | |
| Pig iron, ferroalloys, and similar materials | r 3,225 | 1,509 |
| Steel, primary forms | 3 | 7 |
| Semimanufactures | 25,828 | 26,385 |
| Lead: | | |
| Ore and concentrate | r 2,160 | 1,520 |
| Oxides | (3) | -- |
| Metal including alloys: | | |
| Unwrought | -- | 300 |
| Semimanufactures | r 219 | 345 |
| Manganese: | | |
| Ore and concentrate | r 10,490 | 17,240 |
| Oxides | -- | 40 |
| Tin: | | |
| Metal including alloys, unwrought long tons | 21,495 | 22,313 |
| Slag [2] | -- | 2,834 |
| Titanium oxides | 24 | 4 |
| Tungsten: [2] | | |
| Ore and concentrate | 5,843 | 4,756 |
| Metal including alloys, unwrought | -- | 42 |
| Uranium and thorium, ores and concentrates | -- | 152 |
| Zinc metal including alloys, semimanufactures | r 115 | 559 |
| Other: | | |
| Ores and concentrates | 43,254 | 124,339 |
| Ash and residue containing nonferrous metals | 180 | 43 |

See footnotes at end of table.

Table 2.—Thailand: Exports and reexports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| NONMETALS | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | (3) | -- |
| Grinding and polishing wheels and stones | -- | 1 |
| Barite [2] | 40,450 | 94,438 |
| Cement | r 736,632 | 3,958,000 |
| Clays and clay products: | | |
| Crude clays, n.e.s.: | | |
| Fuller's earth, dinas, and chamotte | r 1,464 | 1,000 |
| Kaolin | 1,712 | 1,331 |
| Products: | | |
| Refractory | 70 | 311 |
| Nonrefractory | 463 | 1,121 |
| Diamond, gem, not set or strung carats | 2,451 | 698 |
| Feldspar, leucite, nepheline, and nepheline syenite | -- | 1,800 |
| Fertilizer materials: | | |
| Crude and manufactured: | | |
| Nitrogenous | -- | 44 |
| Potassic | 402 | 574 |
| Other and mixed | r 33 | 633 |
| Ammonia, anhydrous | -- | 61 |
| Fluorspar | 274,490 | 275,508 |
| Gypsum | 7,593 | 41,726 |
| Magnesite | -- | 260 |
| Precious and semiprecious stones, except diamond: | | |
| Natural thousand carats | r 15,757 | 384,621 |
| Manufactured do | r 8,398 | 681 |
| Salt | 1,476 | 4,511 |
| Stone, sand and gravel: | | |
| Dimension stone crude and partly worked: | | |
| Calcareous | (3) | -- |
| Other | -- | 360 |
| Gravel and crushed rock | 228 | 1,037 |
| Limestone | 84 | 31 |
| Quartz and quartzite | -- | 4,001 |
| Sand, excluding metal bearing | 3 | -- |
| Talc and related materials, pyrophyllite [2] | 200 | -- |
| Other, slag, dross and similar waste, not metal bearing, n.e.s | r 4,825 | 6,105 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Asphalt and bitumen, natural | -- | 914 |
| Carbon black | 5 | 10 |
| Coal briquets | 5 | 1 |
| Petroleum refinery products: [4] | | |
| Gasoline, motor and aviation thousand 42-gallon barrels | r 1,296 | 1,091 |
| Kerosine do | r 196 | 246 |
| Jet fuel do | r 165 | 337 |
| Distillate fuel oil do | r 704 | 775 |
| Residual fuel oil do | r 814 | 1,422 |
| Lubricants do | r 18 | 15 |
| Other: | | |
| Liquefied petroleum gas do | 164 | 355 |
| Unspecified do | 87 | 363 |

r Revised.
[1] Source unless otherwise specified: Department of Customs, Bangkok, Thailand. Foreign Trade Statistics of Thailand, December 1972 and December 1973.
[2] Source: Department of Mineral Resources, Bangkok, Thailand. Mineral Production, Exports and Domestic Consumption of Thailand, 1964–1973. 1974, 51 pp.
[3] Less than ½ unit.
[4] Includes bunkers.

Crude petroleum imports led by a wide margin as the country's chief mineral import expenditure. In 1974 the cost was nearly triple that of 1973 and was the principal cause of the enlarged trade deficit. Other leading mineral imports, for which the country spent appreciably more in 1974, were iron and steel, refinery products, fertilizers and pesticides, and other base metals.[9]

[9] Bank of Thailand. Monthly Bulletin. V. 15, No. 4, April 1975, pp. 40–55.

## Table 3.—Thailand: Preliminary data on exports of selected mineral commodities in 1974 [1]

(Metric tons unless otherwise specified)

| Commodity | Quantity | Value [2] (thousands) |
|---|---|---|
| Antimony: | | |
| Ore and concentrate, gross weight | 6,462 | $4,942 |
| Metal | NA | NA |
| Barite | 75,337 | 1,703 |
| Cement [3] | 919,536 | 31,924 |
| Clays (kaolin only) | 5,258 | 128 |
| Columbite-tantalite concentrate, gross weight | 65 | 344 |
| Fluorspar [3] | 305,541 | 18,815 |
| Gypsum | 132,005 | 1,674 |
| Lead ore | 885 | 59 |
| Manganese, ore, gross weight [3] | 18,780 | 683 |
| Rare-earth minerals, monazite | 302 | 44 |
| Salt | 107,577 | 1,664 |
| Talc and related materials, pyrophyllite | NA | NA |
| Tin metal long tons | 19,161 | 147,053 |
| Tungsten ore and concentrate, gross weight | 4,209 | 19,112 |

NA Not available.
[1] Source unless otherwise specified: Thai Department of Mineral Resources.
[2] Converted from reported figures in bahts (B) at the rate of B20.375=US$1.00.
[3] Department of Customs, Bangkok, Thailand. Foreign Trade Statistics of Thailand. December 1974, 579 pp.

## Table 4.—Thailand: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum: | | |
| Bauxite and concentrate | -- | 3,065 |
| Metal including alloys: | | |
| Scrap | 486 | 829 |
| Unwrought | 12,894 | 21,850 |
| Semimanufactures | r 5,551 | 26,826 |
| Antimony: | | |
| Ore and concentrate | -- | 25 |
| Metal including alloys, all forms | r 1 | 10 |
| Arsenic trioxide, pentoxide, and acids | 32 | 95 |
| Cadmium metal including alloys, all forms | (1) | (1) |
| Cobalt: | | |
| Oxides and hydroxides | 6 | 224 |
| Metal including alloys, all forms | (1) | 1 |
| Copper: | | |
| Ore and concentrate | -- | 20 |
| Matte | 141 | 478 |
| Copper sulfate | 81 | 131 |
| Metal including alloys: | | |
| Scrap | 632 | 1,638 |
| Unwrought | 546 | 430 |
| Master alloys | 5 | 2 |
| Semimanufactures | r 4,703 | 5,141 |
| Gold metal, unworked or partly worked troy ounces | 925,908 | 9,409 |
| Iron and steel: | | |
| Ore and concentrate | 23 | -- |
| Metal: | | |
| Scrap | 280,654 | 365,801 |
| Pig iron, ferroalloys, and similar materials | 4,400 | 4,460 |
| Sponge iron, powder and shot | 135 | 419 |
| Steel ingots and other primary forms | 1,052 | 2,115 |
| Semimanufactures | 610,217 | 686,340 |
| Lead: | | |
| Oxide | 463 | 331 |
| Metal including alloys: | | |
| Scrap | 105 | 319 |
| Unwrought | 4,155 | 6,961 |
| Semimanufactures | r 486 | 982 |

See footnotes at end of table.

## Table 4.—Thailand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS—Continued | | |
| Magnesium metal including alloys: | | |
| Ore and concentrate | 80 | 20 |
| Scrap | -- | (1) |
| Unwrought | (1) | 5 |
| Semimanufactures | 3 | 398 |
| Manganese: | | |
| Ore and concentrate | 424 | 334 |
| Oxides | 489 | 545 |
| Mercury 76-pound flasks | 489 | 303 |
| Molybdenum metal including alloys, all forms | (1) | 1 |
| Nickel: | | |
| Ore and concentrate | (1) | -- |
| Matte, speiss, and similar materials | 12 | 7 |
| Metal including alloys: | | |
| Scrap | 6 | -- |
| Unwrought | -- | 222 |
| Semimanufactures | r 744 | 311 |
| Platinum-group metals including alloys, all forms troy ounces | 2,186 | 135,483 |
| Silver metal including alloys do | r 981,625 | 272,541 |
| Tin: | | |
| Oxides long tons | (1) | 1 |
| Unwrought do | 1 | 3 |
| Semimanufactures do | 2 | 1 |
| Titanium: | | |
| Ore and concentrate | 461 | 1,031 |
| Oxide | 2,315 | 3,315 |
| Tungsten metal including alloys, all forms | 1 | 11 |
| Zinc: | | |
| Ore and concentrate | (1) | -- |
| Oxide | 1,846 | 2,012 |
| Metal including alloys: | | |
| Scrap | 555 | 789 |
| Powder and dust | r 29 | 6 |
| Unwrought | 24,501 | 22,070 |
| Semimanufactures | 1,493 | 1,115 |
| Zirconium ore and concentrate | 1 | 1 |
| Other: | | |
| Ore and concentrate of base metals, n.e.s | 4,476 | 1,308 |
| Metals including alloys, all forms: | | |
| Alkali, alkaline earth, and rare-earth metals | (1) | 3 |
| Pyrophoric alloys | 16 | 39 |
| Base metals including alloys, all forms, n.e.s | 1 | 1 |
| NONMETALS | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | 1,615 | 1,867 |
| Dust and powder of precious and semiprecious stones kilograms | 2 | 31 |
| Grinding and polishing wheels and stones | 941 | 1,317 |
| Asbestos | 26,175 | 36,310 |
| Barite and witherite | 21 | 6 |
| Bromine: | | |
| Elemental kilograms | 10,036 | 31,438 |
| Compounds, n.e.s do | r 26,106 | 47,266 |
| Cement | 1,018 | 35 |
| Chalk | 292 | 446 |
| Clays and clay products: | | |
| Crude clays, n.e.s.: | | |
| Fuller's earth, dinas, and chamotte | 1,002 | 2,065 |
| Kaolin | 5,160 | 7,174 |
| Products: | | |
| Refractory (including nonclay brick) | r 7,759 | 6,424 |
| Nonrefractory | 907 | 139 |
| Cryolite and chiolite | 9 | 2 |
| Diamond: | | |
| Gem, not set or strung carats | 6,513 | 20,000 |
| Industrial do | 653,158 | 175,594 |
| Diatomite and other infusorial earth | 86 | 260 |
| Feldspar, leucite, nepheline, and nepheline syenite | 3,786 | 1,512 |
| Fertilizer materials: | | |
| Crude and manufactured: | | |
| Nitrogenous | 39,250 | 37,655 |
| Phosphatic | 5,547 | 7,550 |
| Potassic | 4,860 | 5,709 |
| Other, including mixed | r 338,665 | 344,101 |
| Ammonia, anhydrous | 214 | 310 |
| Fluorspar | 100 | 45 |
| Graphite, natural | 746 | 1,312 |
| Gypsum, anhydrite and plasters | 742 | 257 |

See footnotes at end of table.

## Table 4.—Thailand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| NONMETALS—Continued | | |
| Iodine | 1 | 2 |
| Lime | 64 | 182 |
| Magnesite | 246 | 644 |
| Mica | 52 | 158 |
| Pigments, mineral, including processed iron oxides | r 998 | 1,254 |
| Precious and semiprecious stones, except diamond: | | |
| Natural kilograms | 7,414 | 217,454 |
| Manufactured do | 3,408 | 1,884 |
| Pyrite (gross weight) | 50 | -- |
| Salt | 163 | 152 |
| Sodium and potassium compounds, n.e.s | r 1,852 | 3,292 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude: | | |
| Calcareous (marble) | r 304 | 84 |
| Slate | 45 | 5 |
| Other | 496 | 1,476 |
| Worked: | | |
| Calcareous (marble) | 838 | 1,298 |
| Slate | 62 | 125 |
| Paving and flagstone | 3 | (1) |
| Other | 199 | 69 |
| Dolomite, chiefly refractory grade | 1 | 14 |
| Gravel and crushed rock | 341 | 346 |
| Limestone (except dimension) | 5 | 4 |
| Quartz and quartzite | 1,017 | 1,064 |
| Sand, excluding metal bearing | 333 | 44 |
| Sulfur: | | |
| Elemental: | | |
| Other than colloidal | r 8,747 | 7,220 |
| Colloidal | 389 | 11,874 |
| Sulfur dioxide | 78 | 13 |
| Sulfuric acid | 17 | 20 |
| Talc and steatite | 4,195 | 7,851 |
| Other nonmetals, n.e.s.: | | |
| Crude | r 7 | 4 |
| Slag, dross and similar waste, not metal bearing | 2,110 | 1,078 |
| Oxides and hydroxides of barium, magnesium, and strontium | 36 | 50 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Asphalt and bitumen, natural | 41 | 119 |
| Carbon black | 8,597 | 9,476 |
| Coal, all grades, including briquets | 429 | 1,449 |
| Coke and semicoke | 14,726 | 17,492 |
| Peat | 5 | 20 |
| Petroleum: | | |
| Crude and partly refined: | | |
| Crude thousand 42-gallon barrels | r 8,337 | 23,001 |
| Partly refined do | 39,618 | 32,104 |
| Refinery products: [2] | | |
| Gasoline, aviation do | r 126 | 636 |
| Gasoline, motor do | r 119 | 390 |
| Kerosine do | 79 | 60 |
| Jet fuel do | r 31 | 14 |
| Distillate fuel oil do | 3,966 | 5,580 |
| Lubricants do | 612 | 614 |
| Other: | | |
| Liquefied petroleum gas do | 4 | -- |
| Mineral jelly and wax do | r 68 | 75 |
| Nonlubricating oils, n.e.s do | 192 | 359 |
| Bitumen and others do | 6 | 11 |
| Bituminous mixtures, n.e.s do | 5 | 7 |
| Pitch, pitch coke, and petroleum coke do | r 37 | 12 |
| Unspecified do | r 267 | 144 |
| Total do | r 5,512 | 7,902 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | r 1,657 | 851 |

r Revised.
1 Less than ½ unit.
2 Includes bunkers.

## COMMODITY REVIEW

### METALS

**Iron and Steel.**—Production of iron ore in Thailand in 1974 remained at the 1973 level of 36,000 tons, an improvement over the recent low of 22,000 tons in 1970 but far below the peak years of the mid-1960's when production exceeded 700,000 tons. Imports of iron and steel scrap, pig iron, and semimanufactures continued to climb rapidly in 1973, reaching about 1,057,000 tons, an 18% increase over the 895,000 tons imported in 1972; about 184,000 tons, or 17% of the 1973 total, came from the United States. Preliminary figures for 1974 indicated a 12% decrease in imports to about 932,000 tons, and a continuation of the steeply rising price trend.

Production of pig iron, crude steel, and steel billets in the country increased 11% from 306,000 tons in 1973 to 338,000 tons in 1974. Since most steel production is consumed domestically, exports of steel products were relatively small.

A project to build an integrated steelworks in Thailand was postponed late in 1974, nominally on account of the current labor unrest. The Thai Government, four Japanese steel companies—Nippon Steel Corp., Nippon Kokan KK, Kawasaki Steel Corp., and Sumitomo Metal Industries, Ltd., and four Japanese trading companies—Mitsui & Co., Mitsubishi Corp., C. Itoh & Co., and Marubeni-Iida Co. Ltd.—had planned the complex which was to include a steel mill along with hot-rolled and cold-rolled sheet mills. Another likely reason for the postponement was a Japanese Government policy aimed at slowing down Japanese overseas investment. Without an export market the project would only have added to the local steel industry's excess capacity problem.[10]

The United States quota on scrap iron exports to Thailand was increased in the first quarter of 1974 to provide some relief to Thai producers who had been forced to reduce production because of a worldwide steel scrap shortage. However, escalating production costs, a work stoppage by construction contractors, and a restriction on exports of steel bars imposed by the Thai Ministry of Commerce caused a further production cutback. As a result, most of the additional quota was not utilized.[11]

**Lead.**—Lead ore production in 1974, at 3,600 tons, declined again following an unusually high output of 8,700 tons in 1973. Lead content of the ore averaged 43% both years.

**Tin.**—Tin remained Thailand's most valuable mineral product topping its nearest rival, cement, by a margin of almost 2 to 1 in value. Output of tin concentrate, assaying an average of 73.2%, declined slightly in 1974 to 27,332 long tons, down 3% from the 28,114 long tons produced in 1973. Tin metal production decreased 14% to 19,514 tons. Soaring tin prices increased the total value of tin concentrate to $156 million, 70% above the $92 million received for the commodity in 1973. Exports of tin metal were off 14% to 19,161 long tons in 1974 from 22,313 long tons in 1973, but exported tin values climbed approximately 50% above 1973 reaching $147 million. Sales of tin metal to the United States declined significantly for the second straight year to 5,239 long tons from 7,260 long tons in 1973, a drop of 28%, but higher prices caused the export value to rise to $38.3 million, 19% more than the $32.1 million sold to this country in 1973. Shipments of 30,361 long tons from the U.S. stockpile contributed to this decline and filled most of the gap between world production and demand and may have contributed to the eventual moderation of the price spiral.

A total of 669 mines operated in 1974, slightly more than in the previous year. Included were 24 dredges, 278 gravel pump mines, 12 hydraulic mines, 108 ground sluicing operations, 211 tin-tungsten mines, and 36 miscellaneous operations. Total employment averaged about 37,000, a bit less than the 38,000 employed in 1973 (a typographical error caused the figure 3,800 to be reported in the 1973 Minerals Yearbook).[12]

Production remained below average during the early part of 1974 due to a shortage of diesel oil stemming from the worldwide

[10] Japan Metal Bulletin. Steel Makers, Trades to Bid for Projects in Thailand. No. 2973, Apr. 24, 1973.
U.S. Embassy, Bangkok, Thailand. State Department Airgram A–290, Oct. 25, 1974.
[11] U.S. Embassy, Bangkok, Thailand. State Department Telegram 3724, Mar. 6, 1974, and State Department Telegram 12377, July 31, 1974.
[12] Thailand Department of Mineral Resources. Mineral Resources Gazette. Issues of March 1974 to January 1975, tables 1, 5, and 7.

petroleum crisis. Mining operations thereafter returned to a normal level until the onset of the TEMCO controversy in the fall, which brought operation of the company's large dredge at Phangnga to a stop pending its resolution.

World prices for tin metal peaked in mid-1974 and descended during the second half of the year but by yearend were still above their levels at the end of 1973. The price at New York, N.Y., rose to $4.63 per pound in June and finished the year at $3.52 per pound while the export price f.o.b., Bangkok, reached $4.02 per pound in May and then descended to $2.71 per pound in December.[13] The continued gap between world production and consumption of tin, the near depletion of the International Tin Council's buffer stock, the worldwide inflation and unstable currency exchange ratios, all of which added further fuel to the fires of speculation, were the principal reasons for the record-breaking price rise.

Discovery of a new alluvial tin deposit off the west coast of Thailand was announced by Leighton Mining N.L. The discovery was made in a 90,000-acre offshore concession area between Ranong and Phuket which Leighton is exploring in a joint venture with Boonsoong Tin Dredging Co. Preliminary estimates put the deposit at 40 million cubic yards grading 0.34 pound of cassiterite per yard. No decision on mining had been made pending completion of the exploration program.[14]

A favorable report also was made by Canadian-Siam Resources on drilling results from their lease in Yala Province. Assays from nine drill holes led to an estimate of 400,000 tons of recoverable tin ore.[15]

**Tungsten.**—Production of tungsten underwent another sharp drop in 1974, declining by 15% to 4,276 tons from 5,048 tons in 1973. Nonetheless, Thailand still produced about 6% of the world total. The average value per ton rose from $3.05 to $5.47 boosting the total value to $23.4 million from $15.4 million in 1973, a gain of 52%. All production is exported.

Tungsten mining continued to be carried out mainly by small operators. Despite the smaller output in 1974, both the number of mines and the number of employees were approximately double those of 1973. An average of 18 mines employing 1,300 miners were active in 1974 as compared with 9 mines and 654 employees in 1973. The strong uptrend in prices was undoubtedly a factor behind the increased mining activity.

A proposed increase in the disposal rate of tungsten in the U.S. stockpile from 6 million to 10 million pounds per year was cancelled partly because the higher rate might have a depressing effect on world prices.[16]

**Zinc.**—Output of zinc concentrate, assaying approximately 23%, reportedly reached about 143,000 tons in 1974, the first year of large-scale zinc production in Thailand. The ore, valued at approximately $8 million, was taken from the Mae Sot mine of Thai Zinc Ltd., a subsidiary of New Jersey Zinc Co. (NJZ). Nearly one-half of the concentrate was shipped directly from Thailand to an NJZ processing plant in Palmerton, Pa., for further beneficiation; the remainder was held in inventory as feed for a 60,000-ton-per-year electrolytic zinc refinery scheduled to be built in northern Thailand. Total reserves in the deposit were estimated at 3.5 million tons reportedly implying a life of 10 or 11 years.

**Other Minerals.**—Hibino Kinzoku Kogyo opened an antimony mine at Banpin in June 1974. Initial production was at the rate of 150 tons of contained antimony per month. Reserves were estimated to be 500,000 tons of antimony. The entire production of concentrates will be shipped to Hibino's plant in Japan.[17]

Copper deposits in Loei Province attracted the interest of mining firms during the year. A tender offer by the Thailand Department of Mineral Resources (DMR) drew requests for application forms from more than 30 companies. Examinations by geologists of the sites and of the cores from earlier exploratory drilling by DMR had stimulated the interest. The bids were under study by DMR.[18]

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[13] Bank of Thailand. Monthly Bulletin. V. 15, No. 4, April 1975, statistical section, p. 74.
Tin International. Tin Publications, Ltd. V. 48, No. 2, February 1975, statistical supplement.
[14] World Mining. Offshore Tin Reserves Discovered by Leighton Mining on West Coast. V. 27, No. 10, September 1974, p. 109.
[15] Tin International. Mining in Thailand. V. 47, No. 1, January 1974, p. 12.
[16] U.S. Embassy, Bangkok, Thailand. State Department Telegram 10616, June 1974, p. 1.
[17] Japan Metal Bulletin. Thai, Saudi Arabia Will Supply Antimony Ore. Apr. 11, 1974, p. 4.
[18] World Mining. What's Going on in World Mining. V. 27, No. 1, January 1974, p. 58.

Output of manganese declined in 1974, with the downturn being distributed about evenly between metallurgical and battery grades. Continuing price increases, however, kept production well above the level that prevailed before 1973. No new mining or processing developments occurred during the year.

## NONMETALS

**Barite.**—The upsurge in oil-well drilling in Southeast Asia resulting from the petroleum shortage early in the year boosted the demand for barite for use as a component of drilling muds. Barite production responded with an 80% rise to 201,000 tons in 1974 from the 112,000 tons produced in 1973. Exports of barite decreased 20% in 1974 to 75,337 tons. The average export price in 1974 was $23 per ton, compared with the 1973 value of $25 per ton. Thailand contains many rich deposits of barite grading as high as 80% $BaSO_4$, but mining has remained largely in the hands of small producers whose output is marketed through agents in Bangkok. A few larger companies also mine barite, in some cases under a purchase contract with an individual foreign consumer.

**Cement.**—Cement output remained on a gradual uptrend in 1974, increasing by 6% to 3,958,000 tons as compared with 3,745,000 tons in 1973. Exports rose to 920,000 tons, 5% above the 1973 level of 878,000 tons, and the value of exports approximately doubled, rising to $32 million in 1974. Domestic demand increased slightly, but domestic prices continued to be restricted by the Thai Government. Increasing costs, particularly for fuel oil, therefore rendered domestic sales less attractive and induced further efforts by producers to develop export markets.[19]

Despite the continued problem of overcapacity relative to domestic requirements and the resulting dependence on increased exports, the cement industry continued to plan further expansions as reported in the 1973 Minerals Yearbook. Thai Sathapana Co. Ltd. planned a new 1,000-ton-per-day plant at Amphur Pak Tho in Ratchburi Province which was to begin production early in 1975. Jalaprathan Cement Co. Ltd. proposed to double the capacity of its plant at Cha-Am in Petchuri Province from 1,500 to 3,000 tons per day, and to raise the capacity of its Takhli, Nahhon Sawan plant 1,000 to 1,250 tons per day. Siam Cement Co. Ltd. planned to double the capacity of its plant at Kaeng Khor, Saraburi Province, from 750,000 to 1,550,000 tons per year by mid-1975.[20] Siam City Cement Co. Ltd. was preparing to boost its capacity at Kaeng Khoi from 2,000 to 5,000 tons per day. When completed the projects will add approximately 2.5 million tons per year to the present 4.3 million-ton-per-year capacity. A strong increase in export sales will be imperative if the new capacity is to be profitable.[21]

In a related development, Siam Iron and Steel Co. Ltd., announced plans to increase its capacity for producing prestressed concrete reinforcing wire at its Ta Luang plant to 20,000 tons per year in several steps by 1977.[22]

**Fertilizer Materials.**—Thailand's shortage of fertilizers, principally nitrogen and phosphate varieties, became more acute in the early part of 1974 as world supplies dwindled. Higher prices stemming from rising crude oil costs further aggravated the small farmers' plight. In order to relieve the situation, the Government cancelled regulations banning fertilizer imports.[23]

A long-range solution to the problem remained in the distant future, but the possibility improved with the discovery of large potash deposits in northeastern Thailand during the year. Deposits of carnalite in the vicinity of Udon Thani, averaging more than 100 feet in thickness, were revealed by a DMR drilling program during the year. Concurrently, a deposit of sylvite, a superior source of potash, was located across the border in Laos. If the Laos deposit proves feasible after exploration, it will probably be developed first; otherwise, the Thai deposits may become the prime fertilizer sources for Southeast Asia[24]

A granulation plant, which will grind and mix imported fertilizer raw materials, was under construction and was expected to go onstream early in 1975. The plant, owned by Thai Central Chemical Co., is located in Bangkok.[25]

[19] Kaiser Cement and Gypsum Corp. Annual Report. 1974, p. 12.
[20] Pit and Quarry. Three Thailand Firms to Increase Cement Output. V. 67, No. 3, September 1974, p. 28.
[21] U.S. Embassy, Bangkok, Thailand. State Department Airgram A–113, Apr. 19, 1974, p. 2.
[22] Investor. SISCO Expands. V. 4, No. 11, November 1973, p. 543.
[23] Investor. Progressive Policy for Fertilizers. V. 5, No. 3, March 1974, p. 170.
[24] U.S. Embassy, Bangkok, Thailand. State Department Telegram 19096, January 1975.
[25] Page 174 of work cited in footnote 23.

**Fluorspar.**—During 1974 about 54,000 tons of acid-grade fluorspar (acid-spar) and 336,000 tons of metallurgical-grade fluorspar (met-spar) were produced in Thailand. This represents a 54% increase in acid-spar production and a 2% decrease in met-spar production compared with 1973. About 181,000 and 28,000 tons of met-spar and acid-spar, respectively, were exported to Japan. Approximately 67,000 tons of fluorspar was shipped to the U.S.S.R. The remainder was exported mainly to Far Eastern countries. Less than 1,000 tons of met-spar was used internally in the steel industry.

Thai Fluorite Processing Company Ltd.'s concentrating plant, which is located in Petchaburi Province and is jointly owned by Kaiser Cement Co. (60%) and Jalaprathan Cement Co. (40%) continued in full operation during the year. This is the only fluorspar froth flotation plant in Southeast Asia. During the year the company abandoned its mining operations and adopted the policy of supplying its plant with custom ore. All of the acid-spar they produced was sold to Ataka Trading Co. of Japan, and most of it was shipped to Japan.

Although Japan is trying to diversify its source of fluorspar, it still imports over 65% of domestic demand from Thailand. Universal Mining Co., which is controlled by Japanese interests, continued to operate its heavy-media separating plant in the Ban Hong District near Chiengmai, Lamphun Province.

About 155 fluorite deposits have been identified in Thailand. During 1974, an average of 76 deposits were worked and regularly employed about 6,600 people. During the last 4 months, employment dropped off until there were only about 5,000 people employed in mining at year-end.

The domestic price of met-spar averaged $38.35 per ton on the Bangkok market for the first 6 months, but increased to about $46 per ton by yearend. The export price f.o.b. port of Bangkok was usually $1 to $3 more per ton, and it also increased toward the end of the year when a fuel shortage developed. At the first of the year, acid-spar was quoted at $65 per ton, but by the end of the year the price was up about 15%, f.o.b. port of Bangkok. The rising value of fluorspar at the end of the year reflected increased costs of wages and fuel.

No further activity has been reported on the proposal by a Thai-Australian venture to build in the Cha-am area a $2 million flotation plant to produce 150,000 tons annually of chemical-grade fluorspar.

**Gypsum.**—Output of gypsum rose strongly in 1974, the second consecutive year of rapid growth. Production rose to 312,000 tons in 1974, an increase of 32% above that produced in 1973. Exports of approximately 132,000 tons represented a tripling of 1973 shipments of 42,000 tons.

**Other Nonmetals.**—Kaolin production trebled in 1974 reaching 61,000 tons compared with 19,000 tons in 1973. Output of feldspar recorded another strong increase of 55% to 6,998 tons. Production of silica sand rose by a more moderate 16%. On the negative side, quartz production was down 22% and output of talc group minerals dropped 81% from an abnormally high peak in 1973.

The planned salt mine of the Thai Asahi-Diamond Shamrock combine at Chaiyaphum in Nakhon Ratchasima Province expects to produce limestone and soda ash as byproducts.[26]

## MINERAL FUELS

**Coal.**—Lignite production increased to 485,000 tons in 1974, a gain of 34% over the 361,000 tons produced in 1973. The two major producing areas were at Mae Moh in Lamphun Province and in Krabi Province. Output was reported at four mines, and a total of approximately 700 miners were employed. The entire output was consumed domestically, mainly for power generation and fertilizer production, and none was exported. The country imports more than half of its coal requirements.

Plans have been announced for a second lignite-burning powerplant of 75 megawatts at Mae Moh, which is scheduled for completion in 1978.[27] The plant will be owned by the Electricity Generating Authority of Thailand (EGAT), and was estimated to cost $34.5 million.

**Petroleum.**—Petroleum was Thailand's chief mineral concern, as it was for virtu-

[26] Far Eastern Economic Review. Thailand: Potential for Potash. V. 88, No. 16, Apr. 18, 1975, p. 41.

[27] U.S. Embassy, Bangkok, Thailand. State Department Airgram A–109, Apr. 11, 1975.

ally the entire world in the early part of 1974. Despite the necessity for restricting consumption of oil products and establishing priorities for uses, the country came through the oil shortage period with relatively little damage. Places of entertainment, neon lighting, and night gasoline station service were limited or closed down. A list of 11 priority industries was established, and fuel was allocated according to consumers' historical record of purchases. Some shortages did occur, particularly those affecting internal transportation and export shipping of agricultural products. Also, a certain amount of hoarding and black market operations took place. Purchases totaling 125,000 tons of diesel oil were negotiated with the People's Republic of China in the early part of the year in order to alleviate critical requirements for diesel oil by Thailand's internal transportation system.[28]

Petroleum product prices were forced to rise substantially due to increased crude oil costs, but the Government maintained controls on product prices in order to reduce their impact on the country's already high inflation rate. As a result, many of the country's refineries complained of reduced profit margins.[29]

Greater success was achieved in petroleum exploration in the Gulf of Thailand than in previous years. By the end of 1974, a total of 20 offshore wells had been drilled, and 7 of these encountered oil or natural gas. The unusually high success ratio was tempered, however, by the failures of two subsequent wells which had been intended to delineate the field. Those failures raised the possibility that the offshore petroleum might be limited to scattered pockets and may not constitute a large reservoir. The drilling programs planned for 1975 should answer the question. Production from the successful wells is slated to begin in 1976.[30]

That same year will see the first wells drilled in a newly leased concession area of the Andaman Sea in water depths exceeding 200 meters (656 feet). Blocks W7, W8, and W9 were leased respectively to Oceanic Exploration Southeast Asia, Inc., jointly with Suwannamas Co., Ltd., a combine of Union Oil Co., Amoco Petroleum Co., British Petroleum Co., Hamilton Brothers Thailand SDAD, Ltd., Seamens Resources, Ltd., and Esso. To offset the higher cost of deep-water operations, the Government reduced the royalty rate for output from 12-½% to 8-½%.[31]

Investigation of a different source of oil took a further step forward with the announcement that the Government was setting up a pilot plant to refine oil shale at Li in Lamphun Province. The $25,000 plant may be expanded into a full-scale mining and refining venture if it proves successful.[32]

Construction of a proposed petrochemical complex at Sri Racha was postponed because of the petroleum shortage. The Thai Petrochemical Co., Ltd., complex, a joint venture of the Japanese Mitsui and Mitsubishi companies, Royal Dutch Shell, and Thai interests, was to include upstream facilities for producing ethylene and propylene from naphtha cracking, and downstream facilities for turning out a variety of chemical derivatives at a total estimated cost of $450 million. The Japanese partners stated their desire to postpone the project for 2 or 3 years citing reduced industrial demand in the wake of the oil shortage, difficulty in obtaining financing, and local conservationists opposition among other reasons. A more restrictive Japanese Government policy on overseas investment was considered a further possible factor.[33]

[28] U.S. Embassy, Bangkok, Thailand. State Department Telegrams 310 and 914, January 1974.
U.S. Consulate, Hong Kong. State Department Airgram A–73, Apr. 15, 1975.
[29] U.S. Embassy, Bangkok, Thailand. State Department Telegram 15166, September 1974.
[30] U.S. Embassy, Bangkok, Thailand. State Department Airgram A–111, Apr. 11, 1975, p. 6.
[31] Bangkok Bank Monthly Review. The Energy Crisis and Thailand. V. 15, No. 1, January 1974, p. 19.
U.S. Embassy. Bangkok, Thailand. State Department Telegram 8870, May 1974.
[32] Chemical Age. Thailand to Develop Oil Shale. V. 110, No. 2908, Apr. 11, 1975, p. 11.
[33] U.S. Embassy, Tokyo, Japan. State Department Telegram 11588, September 1974.

# The Mineral Industry of Tunisia

By Roland W. Merwin [1]

Tunisia's gross domestic product (GDP) was approximately $3,073 [2] million, an increase of 22% over the revised GDP of 1973. The mineral share of the GDP, exclusive of the manufacturing sectors of the mineral industry, increased 24% over that of 1973 and comprised about 7% of the 1974 total. Crude petroleum production accounted for approximately 68% of the mineral portion of the GDP. Not only was the mineral segment of the GDP moderately significant by world standards, it was particularly important to Tunisia as a source of foreign exchange.

Although the natural-gas, petroleum, and phosphate-rock sectors of the mineral industry are small by world standards, they were key elements in efforts by the Tunisian Government to industrialize the predominantly agricultural economy and were receiving priority consideration by Government planning organizations. Additionally, attention was being given to expanding the production of barite, cement, fluorspar, iron ore, lead, salt, and zinc. The Government of Tunisia was active in promoting foreign investment in the mineral industry, with emphasis on projects that would process raw materials in Tunisia for export.

The petroleum industry continued to be the most important sector of the mineral industry in terms of both present output and future prospects. A major offshore field in the Gulf of Qabis came into production in 1974 at the rate of 40,000 barrels per day, and a smaller onshore field near Sfax was being brought into production. Additionally, a promising new field was discovered offshore in the Gulf of Qabis. The petroleum industry was almost entirely controlled by French and Italian companies in which the Tunisian Government had participating interests. The Government-owned Establishment Tunisienne pour l'Activite Pétrolière (ETAP) was established to hold the Tunisian participation in all petroleum joint ventures. There were plans for ETAP to engage directly in exploration and operations.

The natural gas industry became increasingly important to the industrial development of the nation. With large proven reserves both onshore and offshore, Tunisia's energy needs, formerly supplied by petroleum, were being rapidly shifted to natural gas. Additionally, strong emphasis was placed on establishing petrochemical and fertilizer industries based on natural gas.

The phosphate industry continued to be the second-most-important segment of the mineral industry, and the Government of Tunisia continued to regard its revitalization as one of its most important objectives. The phosphate-rock mining industry is almost entirely owned and operated by the Government-controlled Compagnie des Phosphates et du Chemin de Fer de Gafsa (Sfax-Gafsa), which was engaged in expanding mining activities, modernizing mines and beneficiation-plant facilities, and improving shipping facilities.

One of the major problems facing the Tunisian phosphate-rock industry was marketing its relatively low-grade ores in competition with higher grade ores from other exporting countries. Therefore, top priority was placed on expanding the fertilizer-manufacturing industry to permit the export of a finished product. The major fertilizer manufacturer, the Government-controlled Industries Chimiques Maghrébines (ICM), doubled its phosphoric acid production capacity during 1974 and placed a second tankship in operation for transporting this product to European markets. Additionally,

[1] Supervisory physical scientist, Division of Nonmetallic Minerals.

[2] Where necessary, values have been converted from Tunisian dinars (TD) to U.S. dollars at the rate of TD1=US$2.30.

the Government announced plans to construct a new fertilizer-manufacturing complex that would produce both phosphoric acid and ammonia; these products would be used to produce ammonium phosphate fertilizers for export.

The nonferrous and nonmetallic mineral industries continued to receive increasing attention under the auspices of the Government-owned mining company Société Tunisienne d'Expansion Minière (SOTEMI). Emphasis was placed on increasing the production and exportation of lead, zinc, and fluorspar in processed forms.

## PRODUCTION AND TRADE

Among the principal mineral commodities produced in Tunisia, the outputs of iron ore, natural gas, petroleum, and phosphate rock increased in quantity over those of 1973, whereas the outputs of barite, cement, fluorspar, lead, salt, and zinc declined. Overall, there was a substantial increase in the value of mineral production in 1974 compared with that of 1973, principally because of the higher price for phosphate rock in world markets.

As in the past, Tunisia exported most of its mineral production, which continued to make a significant contribution to the export trade. In 1974, minerals and mineral-related products accounted for approximately 63% of the value of the nation's export trade.

The major portion of Tunisia's trade was with Europe, particularly the European Communities (EC), of which Tunisia was an associate member. The second-most-important trade partner was eastern Europe. Available data on mineral production and trade are given in tables 1 to 3.

**Table 1.—Tunisia: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Iron and steel: | | | |
| Iron ore and concentrates, gross weight ___ thousand tons | 890 | 809 | 815 |
| Pig iron ___ do | 143 | 157 | [e] 118 |
| Steel, crude ___ do | [2] 131 | [r e 2] 123 | 106 |
| Lead: | | | |
| Mine output, metal content | 18,300 | 15,576 | 9,860 |
| Metal, primary, unalloyed [3 4] | 25,073 | 25,963 | 26,401 |
| Mercury metal, primary ___ 76-pound flasks | 238 | 112 | 76 |
| Silver metal, primary ___ thousand troy ounces | 242 | 190 | [4] 136 |
| Zinc, mine output, metal content | 10,200 | 8,592 | 5,690 |
| **NONMETALS** | | | |
| Barite | 1,188 | 18,566 | 17,366 |
| Cement, hydraulic ___ thousand tons | [r] 626 | 550 | [e] 500 |
| Clays, construction [e] ___ do | 260 | 230 | 160 |
| Fertilizer materials: | | | |
| Crude natural, phosphate rock ___ do | 3,387 | 3,474 | 3,823 |
| Manufactured: | | | |
| Hyperphosphate ___ do | 9 | 24 | [e] 49 |
| Superphosphate ___ do | 42 | 50 | [e] 25 |
| Triple superphosphate ___ do | 413 | 400 | [e] 327 |
| Fluorspar: | | | |
| Chemical-grade | 40,547 | 43,304 | 28,318 |
| Metallurgical-grade | 5,485 | 3,296 | -- |
| Total | 46,032 | 46,600 | 28,318 |
| Lime, hydraulic ___ thousand tons | 162 | 132 | [5 e] 94 |
| Salt, marine ___ do | 330 | 355 | 244 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Gas: | | | |
| Natural: | | | |
| Gross production ___ million cubic feet | 1,353 | 4,513 | [e] 7,600 |
| Marketed production ___ do | [r] 706 | 4,026 | 7,119 |
| Manufactured ___ do | 656 | 667 | NA |
| Natural gas liquids, natural gasoline ___ thousand 42-gallon barrels | 1 | 2 | [e] 5 |
| Petroleum: | | | |
| Crude oil ___ do | [r] 30,566 | 29,828 | 31,841 |

See footnotes at end of table.

## Table 1.—Tunisia: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Petroleum—Continued | | | | |
| Refinery products: | | | | |
| Gasoline | thousand 42-gallon barrels | 796 | 798 | 1,105 |
| Kerosine | do | 484 | 566 | 707 |
| Distillate fuel oil | do | 2,453 | 2,161 | 2,101 |
| Residual fuel oil | do | 2,989 | 2,956 | 3,115 |
| Other | do | [e] 612 | 883 | 761 |
| Refinery fuel and losses | do | [e] 807 | 1,031 | 400 |
| Total | do | 8,141 | 8,395 | 8,189 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, a variety of crude construction materials (common clays, sand, gravel, and stone) are also produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[2] Production of billets, used in lieu of unreported ingot production.

[3] Pig lead only (excludes lead content of antimonial lead).

[4] From domestic and imported ores.

[5] Quicklime and hydrated lime.

## Table 2.—Tunisia: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, all forms | 40 | 267 | Belgium-Luxembourg 195; Italy 49; France 23. |
| Copper metal including alloys, all forms | 466 | 926 | Belgium-Luxembourg 333; Netherlands 181; West Germany 161. |
| Iron and steel: | | | |
| Ore and concentrate | 664,100 | 423,830 | Italy 219,230; Romania 100,000; Algeria 53,600. |
| Metal: | | | |
| Scrap | 4,896 | 3,896 | Italy 3,872. |
| Pig iron and ferroalloys | 850 | 15,518 | All to Italy. |
| Steel, primary forms | 23,627 | 59,580 | Turkey 27,305; Italy 18,476; Morocco 7,208. |
| Semimanufactures | [r] 45,232 | 69,925 | United States 26,673; United Kingdom 13,791; Algeria 11,460. |
| Lead: | | | |
| Ore and concentrate | 6,266 | 6,176 | All to France. |
| Metal including alloys, all forms | 13,786 | 16,665 | Italy 9,126; Greece 2,341; Libya 1,570. |
| Mercury 76-pound flasks | 50 | 90 | All to Italy. |
| Nickel metal, scrap | -- | 29 | All to France. |
| Silver troy ounces | 322 | -- | |
| Zinc: | | | |
| Ore and concentrate | 16,400 | 15,200 | All to Italy. |
| Metal including alloys | -- | 101 | Mainly to France. |
| NONMETALS | | | |
| Barite and witherite | -- | 13,050 | Italy 12,900; United States 150. |
| Cement | 31,323 | 412 | Libya 264; Greece 114. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays | 75 | 23 | Mainly to Algeria. |
| Products, nonrefractory | 107,062 | 57,836 | All to Libya. |
| Feldspar and fluorspar | 38,525 | 33,020 | United States 20,200; Italy 12,820. |
| Fertilizer materials, phosphatic: | | | |
| Natural thousand tons | [r] 2,468 | 2,377 | France 568; Greece 265; Czechoslovakia 236. |
| Manufactured do | 407 | 389 | France 68; Italy 64; Netherlands 51. |
| Lime | 553 | 70 | Algeria 60; Libya 10. |
| Salt and brine | 255,001 | 307,209 | Norway 72,372; Yugoslavia 67,734; Iceland 47,755. |
| Sulfur, sulfuric acid, oleum | -- | 8,946 | France 5,925; Spain 3,011. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | 1 | -- | |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 28,517 | 28,326 | United States 10,885; France 4,843; West Germany 4,076. |
| Refinery products: | | | |
| Gasoline do | 384 | 5 | All to bunkers. |
| Kerosine do | 392 | 494 | Do. |
| Distillate fuel oil do | 106 | 86 | Bunkers 85. |
| Residual fuel oil do | 308 | 32 | Bunkers 31; U.S.S.R. 1. |
| Lubricants do | 2 | 5 | Bunkers 4; France 1. |
| Total do | 1,192 | 622 | |

[r] Revised.

## Table 3.—Tunisia: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys: | | | |
| Unwrought | (1) | -- | |
| Semimanufactures | 1,183 | 1,122 | United Kingdom 449; France 279; Sweden 120. |
| Chromium, oxide and hydroxide | 3 | 3 | West Germany 2; France 1. |
| Copper metal including alloys, all forms | 1,579 | 1,573 | France 1,076; West Germany 282; Belgium-Luxembourg 102. |
| Gold metal, unworked or partly worked thousand troy ounces | 23 | 26 | Switzerland 24; France 2. |
| Iron and steel: | | | |
| Ore and concentrate | (1) | 37 | All from France. |
| Metal: | | | |
| Scrap | 534 | 282 | West Germany 146; France 123. |
| Pig iron and ferroalloys | 902 | 1,017 | France 865; Canada 80; West Germany 37. |
| Sponge iron, powder, shot | 45 | 63 | France 40; Italy 18; West Germany 5. |
| Steel, primary forms | 14,128 | 6,555 | France 3,624; Italy 1,168; Belgium-Luxembourg 1,000. |
| Semimanufactures | r 100,715 | 116,356 | France 41,512; Japan 31,188; West Germany 16,426. |
| Lead: | | | |
| Ore and concentrate | 200 | (1) | All from France. |
| Oxides | 34 | 63 | France 53; United Kingdom 10. |
| Metal including alloys, all forms | 27 | 45 | France 40; Italy 3. |
| Magnesium metal including alloys, all forms | 6 | (1) | Mainly from France. |
| Mercury 76-pound flasks | 40 | 17 | Do. |
| Nickel metal including alloys, all forms | 14 | 11 | France 8; United Kingdom 2. |
| Platinum-group metals and silver, including alloys: | | | |
| Platinum group troy ounces | 257 | 772 | Mainly from France. |
| Silver do | r 85,808 | 112,332 | Sweden 48,225; France 30,574; West Germany 21,058. |
| Tin metal including alloys, all forms long tons | 55 | 54 | Malaysia 27; France 12; Belgium-Luxembourg 9. |
| Titanium oxide | 351 | 415 | West Germany 194; Belgium-Luxembourg 80; France 65. |
| Zinc: | | | |
| Oxide | 200 | 378 | France 243; West Germany 83; Belgium-Luxembourg 25. |
| Metal including alloys, all forms | 622 | 1,178 | France 856; Italy 253. |
| Other: | | | |
| Ore and concentrate, n.e.s | 1 | 29 | Italy 27. |
| Oxides, hydroxides, peroxides of metals, n.e.s | 115 | 66 | United Kingdom 40; West Germany 21; East Germany 3. |
| Base metals, including alloys, all forms, n.e.s | 31 | 42 | People's Republic of China 40. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 66 | 47 | Italy 35; United States 8; France 4. |
| Grinding and polishing wheels and stones | 83 | 151 | Italy 63; France 47; West Germany 20. |
| Asbestos | 2,288 | 1,121 | Mainly from Canada. |
| Barite and witherite | 2,492 | 2,976 | France 2,466; Italy 510. |
| Boron materials: | | | |
| Crude natural borates | 3 | 2 | All from France. |
| Oxide and acid | 61 | 31 | Mainly from Italy. |
| Cement | 56,682 | 151,448 | U.S.S.R. 73,299; Turkey 36,002; Romania 21,633. |
| Chalk | 665 | 489 | All from France. |
| Clays and clays products including all refractory brick: | | | |
| Crude clays | 11,866 | 11,228 | France 4,256; United Kingdom 3,787; Morocco 2,570. |
| Products: | | | |
| Refractory | 4,876 | 5,132 | France 1,919; Morocco 898; Italy 604. |
| Nonrefractory | (1) | 19 | All from France. |
| Diatomite and other infusorial earths | 141 | 71 | Mainly from France. |
| Feldspar and fluorspar | 504 | 1,206 | Italy 980; France 226. |

See footnotes at end of table.

**Table 3.—Tunisia: Imports of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials: | | | |
| Manufactured: | | | |
| Nitrogenous | 37,353 | 56,893 | France 23,797; Bulgaria 13,392; Greece 12,441. |
| Phosphatic | 134 | -- | |
| Potassic | 546 | 7,299 | Italy 4,494; Belgium-Luxembourg 1,734; West Germany 1,070. |
| Other, including mixed | 301 | 296 | All from West Germany. |
| Ammonia | 32 | 99 | Netherlands 50; West Germany 32; France 17. |
| Graphite, natural | 1 | 1 | All from France. |
| Gypsum and plasters | 381 | 21 | Mainly from France. |
| Lime | 5 | 11 | All from France. |
| Magnesite | 4 | -- | |
| Mica, all forms | 6 | 7 | Mainly from France. |
| Pigments, mineral, including processed iron oxides | 109 | 195 | West Germany 145; Romania 23. |
| Pyrite, gross weight | 5,185 | 5,000 | All from U.S.S.R. |
| Salt and brine | 7 | 20 | Mainly from West Germany. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | r 7,236 | 5,790 | France 2,743; Italy 1,726; Spain 645. |
| Caustic potash and sodic and potassic peroxides | 19 | 11 | West Germany 6; France 5. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 6,082 | 4,856 | Mainly from Italy. |
| Worked | 235 | 6 | Do. |
| Dolomite, chiefly refractory-grade | 220 | 232 | France 194; Italy 37. |
| Gravel and crushed rock | 1,043 | 1,314 | Italy 1,164; France 128. |
| Quartz and quartzite | 522 | 490 | All from Belgium-Luxembourg. |
| Sand, excluding metal-bearing | 5 | 103 | Mainly from France. |
| Sulfur: | | | |
| Elemental, all forms | 167,946 | 66,506 | Canada 29,840; Poland 18,340; France 18,320. |
| Sulfuric acid, oleum | 19,042 | 9,186 | West Germany 8,746; France 309. |
| Talc, steatite, soapstone, pyrophyllite | 1,174 | 2,091 | France 1,079; Italy 1,005. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 109 | 1,000 | All from Italy. |
| Carbon black | (1) | -- | |
| Coal, all grades, including briquets | 24,543 | 32,518 | U.S.S.R. 20,880; France 6,019; United Kingdom 4,009. |
| Coke and semicoke | 112,216 | 78,933 | West Germany 51,145; Italy 25,287; France 2,000. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 5,596 | 7,623 | Saudi Arabia 4,326; Iraq 3,085; Algeria 137. |
| Refinery products: | | | |
| Gasoline do | 300 | 453 | Greece 407; Netherlands 46. |
| Kerosine do | 305 | 215 | Greece 154; Netherlands 23; Italy 19. |
| Distillate fuel oil do | 579 | 575 | Greece 533; Netherlands 39. |
| Residual fuel oil do | r 1,303 | 1,005 | Italy 645; Greece 239; Hungary 107. |
| Lubricants do | 108 | 107 | United States 70; Italy 20; France 15. |
| Mineral jelly and wax do | 7 | 3 | East Germany 1; West Germany 1. |
| Other do | 118 | 142 | Italy 137; United Kingdom 2. |
| Total do | r 2,720 | 2,500 | |

r Revised.
1 Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Iron and Steel.**—Iron ore production increased slightly above that of 1973. The Djebel Djerissa mine continued to be the major producer; the remaining portion of the output was obtained from the relatively small Tamirah mine. The state-owned El Fouladh iron and steel mill was expanding its steelmaking capacity in the expectation that increased local consumption of iron ore would compensate for a continuing decrease in exports of crude ore, which in past years have been mainly to Italy.[3]

[3] U.S. Embassy, Tunis, Tunisia. Industrial Outlook Report: Minerals, 1974. State Department Airgram A-68, June 13, 1975, 11 pp.

**Lead.**—Domestic mine production decreased substantially below that of 1973; all of the output was from the operations of SOTEMI. There were no plans for expansion of mining facilities. Lead concentrate was smelted by Peñarroya-Tunisie at its Mégrine smelter, where output of refined lead was slightly more than that of 1973. This smelter was heavily dependent upon imported lead concentrate from Algeria, Italy, and Morocco; Morocco was the major supplier. Essentially all of the refined lead was exported, with Italy being the major consumer. Morocco was reportedly planning to construct a major smelting complex that would utilize its total lead ore production. Unless new import sources of lead concentrate were developed, this would have an adverse effect on Tunisia's production of refined lead.[4]

**Zinc.**—Mine output of zinc concentrate was substantially lower than that of 1973. All of it was produced by SOTEMI from mines located in western Tunisia, near the Algerian border. The entire output was exported to European markets for refining into metallic zinc. It was anticipated that production would increase during the next few years when the Fradj Hassen mine is brought into production.[5]

**Other Metals.**—Mercury was produced at mining operations, and silver was produced as a byproduct of lead smelting. The outputs of both of these metals were substantially below those of 1973.

## NONMETALS

**Cement.**—Cement was produced at two plants—one in Tunis and one in Bizerte. Output was slightly less than that in 1973 and supplied only about one-half of Tunisia's domestic requirements. Because of projected increases in construction activities, plans were made to increase cement-production capacity as an alternative to continued heavy imports of this commodity. A contract was awarded for the construction of a cement plant at Qabis with a 700,000-ton-per-year capacity. This project was to be undertaken by the Tunisian Government, with possible financing from Arab oil-producing states. Agreement in principle was also reached with Algeria covering the construction of a cement plant at Talah near the Algerian border, to be operated jointly by both countries. This plant would have a capacity of 1 million tons per year. Additionally, an expansion of the present cement plant at Bizerte was under consideration.[6]

**Fertilizers.**—*Phosphates.*—Tunisia ranked fourth among nations of the world as a producer of phosphate rock and fifth as an exporter of this commodity (by quantity). Phosphate rock production in 1974 amounted to 3.82 million tons, 10% more than that of 1973 and 11% greater than the previous record output in 1968. In 1974, 62% of the production was exported directly in the form of crude and ground phosphate rock. The remaining 32% of the output was utilized by domestic fertilizer complexes for manufacturing phosphoric acid and triple superphosphates, also mainly for export.

The financial position of the phosphate-rock-mining industry improved dramatically during 1974 as a result of worldwide increases in phosphate rock prices. The Tunisian export price for phosphate rock increased from $13 per ton in early 1973 to $35 per ton during much of 1974, and finally to $56 per ton in January 1975.[7]

Approximately 92% of the phosphate rock production was derived from seven mines owned and operated by Sfax-Gafsa; operations centered in the Gafsa region of central Tunisia. The remainder of the output was obtained from a mine owned and operated by Société Tunisienne d'Exploitation Phosphatiere in west-central Tunisia near the Algerian border.

In the past, Tunisia found it difficult to market its low-grade ores from high-cost underground mines competitively with other countries that produced higher grade ores from lower cost open pit mines. However, Tunisia's competitive position was being improved by a number of programs designed to remedy this situation. These included increasing production at Tunisia's sole open pit mine, mechanizing underground mines, modernizing beneficiation facilities, and improving the railroad systems between the mines and ports.

In addition to local funding, which became available because of higher phosphate rock prices, Tunisia was receiving substantial international assistance for these projects. The World Bank provided a loan of $23 million to help finance a major expan-

[4] Pages 8–9 of work cited in footnote 3.
[5] Page 9 of work cited in footnote 3.
[6] Pages 9–10 of work cited in footnote 3.
[7] Page 6 of work cited in footnote 3.

sion program at the new Sehib mine. Romania provided financial assistance for the expansion of the M'Rata mine. The Kuwait development fund approved a loan of $6.9 million to help modernize existing mines and ore-treatment facilities. The People's Republic of China (PRC) approved in principal a loan for the purchase of 1,000 railroad cars.[8]

The Government of Tunisia continued its long-range program to expand the fertilizer-manufacturing industry. These programs were based on (1) the availability of low-cost (but low-grade) phosphate rock, which is normally difficult to market in international trade, and (2) the favorable trade agreement with the EC, which gives Tunisia an advantage in marketing the finished fertilizers in the European market. Additionally, exporting finished fertilizers instead of phosphate rock would obtain a better return of foreign exchange.

ICM, the major fertilizer manufacturer, brought a new phosphoric acid plant into production in October 1974, which increased its total phosphoric acid production capability to 250,000 tons per year $P_2O_5$ content.[9] Additionally, ICM improved its phosphoric acid export capability by placing a second phosphoric acid tanker in service in 1974. This vessel, the *Gafsa,* has a 10,500-ton capacity.[10]

The Government of Tunisia decided that, rather than further expand the ICM facilities, it would form a new company to construct and operate a fertilizer-manufacturing complex that would produce ammonium phosphate fertilizers for export. As planned, the new complex would have an annual production capacity of 250,000 tons of phosphoric acid and 365,000 tons of ammonia. Reportedly, the bulk of the financing for this large project will probably be obtained from either Kuwait or Abu Dhabi.[11]

**Fluorspar.**—SOTEMI produced chemical-grade fluorspar at mines in the Zaghwan region of central Tunisia. The output was substantially less than that of 1973. The lower output was accounted for by suspended beneficiation operations at the Hamam Jedidi mine and suspended operations at the Haman Zribi mine during a major modernization and expansion program. Construction of an aluminum fluoride plant at Qabis to utilize domestic fluorspar as a raw material was underway and scheduled for completion in 1976. Reynolds Aluminum Co., a U.S. firm, has a minority interest in this venture, which expected to improve Tunisia's export potential for fluorspar.[12]

**Other Nonmetals.**—Barite, construction clays, hydraulic lime, and marine salt were produced in 1974, but the output of each of these materials was lower than that of 1973. Most of the barite was ground in Tunisia and used for oil well drilling muds, whereas most of the salt was exported. Additionally, common clay and shales, sand and gravel, and stone were produced for local consumption as construction materials. The outputs were not reported.

## MINERAL FUELS

**Natural Gas.**—Marketed production of natural gas was 77% more than that of 1973. Most of the gas was produced in the El Borma Field in southern Tunisia and piplined to Qabis, where it was used for power generation and industrial purposes. Additional compressor stations were being installed to double the capacity of the pipeline.

As a result of a comprehensive study, the Tunisian Government announced that it had proven reserves of approximately 1.8 trillion cubic feet of gas in three offshore gasfields in the Gulf of Qabis. Studies were continuing regarding the economic feasibility of collecting this gas at the rate of about 125 billion cubic feet per year and bringing it onshore by pipeline for utilization by petrochemical and ammonia plants and other industries.[13]

In view of the large proven domestic reserves of natural gas, there was a lessening interest on the part of the Government of Tunisia in participating in the projected natural gas pipline from Algeria through Tunisia under the Mediterranean to Italy.

**Petroleum.**—Crude petroleum production increased 7% above that of 1973. The offshore Ashtart Field came into production in April 1974 and production increased rapidly to over 40,000 barrels per day. This new production more than offset a 30% drop in production at the onshore El Borma Field, which was due primarily to the inauguration of an ambitious program to drill

[8] Pages 6–7 of work cited in footnote 3.
[9] U.S. Embassy, Tunis, Tunisia. Probable Decreased Revenue from Tunisian Phosphate Industry. State Department Airgram A–42, May 13, 1975, enclosure 6 pp.
[10] Phosphorus and Potassium (London). Phosphoric Acid Tanker Design. No. 78, July–August 1975, p. 30.
[11] Page 4 of work cited in footnote 9.
[12] Page 9 of work cited in footnote 3.
[13] Page 5 of work cited in footnote 3.

water-injection wells in order to maintain operating pressures in the field. Production from other small fields in Tunisia remained relatively steady. Plans were made to initiate production at the small, onshore Sidi Behara Field near Sfax.[14]

At yearend 1974, there were 21 outstanding exploration permits covering 187,000 square kilometers, compared with the same number of permits covering 195,000 square kilometers at yearend 1973. About one-half of the area covered was offshore.[15]

Although geological fieldwork and gravitometer and magnetometer surveys decreased in 1974 compared with those activities in 1973, land and marine seismic operations increased roughly 70%. Sixteen exploratory wells were drilled in 1974, 10 onshore and 6 offshore, compared with a total of 9 in 1973. The primary new discovery in 1974 was the very promising offshore Isis Field, approximately 120 miles due east of Sfax in the Gulf of Qabis. Ten development wells were drilled in 1974, including five at the offshore Ashtart Field. All 10 wells were producers.[16]

Several proposals were considered for expanding petroleum refining capacity in Tunisia. Under one plan, the Government decided that instead of entrusting construction of a projected 120,000-barrel-per-day refinery in Qabis to a foreign partner, it would undertake to build a 60,000-barrel-per-day refinery there, whose capacity could eventually be doubled. However, in view of the excess refinery capacity in the Mediterranean area, it was decided to suspend construction of the refinery at this time. It was considered possible that doubling the capacity of the existing 20,000-barrel-per-day refinery in Bizerte would best meet the immediate needs of the country.[17]

[14] Page 3 of work cited in footnote 3.
[15] Page 3 of work cited in footnote 3.
[16] Page 4 of work cited in footnote 3.
[17] Pages 5–6 of work cited in footnote 3.

# The Mineral Industry of Turkey

By E. Shekarchi [1]

During 1974, the Turkish economy continued to show relatively good growth and expansion. Due to world inflation and the cost of raw materials, the mineral industries' contribution to the economy in 1974 was higher than in 1973. The highest gross national product (GNP), in the republic's history, $22.4 billion,[2] was reported for 1974, an increase of 6.6% over that of 1973. Per capita GNP increased 4% from $547 in 1973 to $569 in 1974. Although the number of Turkish workers abroad decreased to about 700,000, their contribution to Turkey's economy was a significant $1.4 billion, an increase of 19% when compared with 1973 returns.

The Turkish mineral industry under the third 5-year plan (1973-77) had a successful year in 1974. Development work advanced in the iron, copper, boron, and phosphate industries. Basic infrastructure projects such as electric power generation, port facilities, irrigation, and water supply were emphasized over industrial investments and capital goods. However, the main aim of the 5-year plan, the reform of the mining and petroleum administration, remained untouched during the year. In this 5-year plan, it was envisaged that a mining office was to be organized to carry out necessary long-term studies of mineral policies, examine international mineral markets, evaluate exploration license applications within 6 months, and prepare a report every 3 years indicating the reserves in areas with operation licenses. Furthermore, under public sector-exploration, activities were to be stepped up, and Etibank, and Türkiye Komur Isletmeleri (TKI) were to be given specified responsibilities.

Turkey's third 5-year plan projected a production of metallic minerals three times greater than the amount produced during the second 5-year plan—or a yearly growth rate of 27%. The yearly growth rate for nonmetallic minerals, excluding coal and petroleum, was projected at 16%. Mining investment including coal and petroleum was projected at $1.2 billion.

The Turkish Parliament ratified an agreement, between Turkey and Iraq, for construction of a crude oil pipeline from the Kirkuk oilfields in Iraq to Dörtyol on the Mediterranean coast of Turkey. In August 1974, Türkiye Petrolleri A.O. (TPAO) organized a subsidiary corporation, Borü Tesisleri A.S. (BOTAS), to assume responsibility for the Turkish portion of the pipeline. In November, BOTAS signed a contract, valued at $400 million, with the West German firm Mannesmann Rohrbau for supply of pipe, pipeline construction, pumping stations, and certain terminal facilities. The pipeline when completed was to transport 25 million tons of crude oil per year. Approximately 640 kilometers of pipeline is in Turkish territory and 341 kilometers in Iraq.

Devlet Su Isleri Genel Müdürlügü (DSI), (Ministry of Hydropower Dams Directorate) increased capacities at some projects, revised the treatment of the work package for tenders, and set more realistic completion dates in order to meet the interconnected power supply target for the country. In 1974, DSI had not begun any new hydroelectric projects; rather, its effort was directed toward the completion of ongoing projects with minimum delays. There were eight projects that DSI planned to initiate during 1975. Also, the agreement initiated in October 1973 with the U.S.S.R. for jointly shared construction

[1] Physical scientist, Division of Ferrous Metals.
[2] Where necessary, values have been converted from Turkish lira (LT) to U.S. dollars, at the rate of LT14=US$1.00.

costs of a dam on the Arpacay River was not finalized in 1974, though DSI intended to implement the agreement in the near future. The Arpacay hydroelectric project was to be completed within 4 years at a cost of $18 million. The Arpacay River forms part of the frontier between the U.S.S.R. and Turkey.

Preparatory work proceeded rapidly for construction of the Arslantas dam. The cost of the dam, about $200 million, was to be financed by $44 million from a World Bank loan, $30 million from International Development Association, and remainder from Turkish sources. The project was expected to be completed by 1981 and was to include a hydroelectric plant with a 138-megawatt generating capacity.

The Kaban hydroelectric powerplant at Elâzig began partial operation in September 1974. By yearend, four of its 150-megawatt units were to be installed. With the opening of the Seyitomer 300-megawatt lignite plant, Turkey's electric generating capacity increased by 25% during 1974.

The world petroleum crisis didn't significantly affect the Turkish supply since Turkey maintained good relations with the petroleum producing nations. However, the price increase, about 50%, was a tremendous drain on the Turkish budget. There were continuing differences between the Ministry for Energy and Natural Resources and two private companies, Mobil Oil Turk A.S. and British Petroleum Co., Ltd., with respect to prices for crude petroleum imports by these companies for their refineries in Turkey. By yearend, no mutually satisfactory answer was found.

A ground breaking ceremony was held in October for a new chemical fertilizer complex in Izmir. Production from the plant, reportedly 306,000 tons of fertilizer per year, would enable Turkey to save several million dollars in foreign exchange. Cost of the project was estimated at $35 million. The investment was shared by more than 3,500 shareholders including some 2,500 Turkish workers employed abroad.

During the past 2 years, the Turkish Government made few currency adjustments in response to international monetary fluctuations. In the latter part of 1974, however, the Government made more frequent adjustments in the exchange rate between the Turkish lira and other national currencies. The most significant of these changes was announced in November when the Turkish lira was, in effect, devalued with respect to most Western European currencies. The value of the Turkish lira was set approximately 8% lower with respect to the Deutsche mark and 9% lower with respect to the Swiss franc. Its parity with respect to the U.S. dollar was not changed significantly. The change in the rate with the Deutsche mark, in particular, was expected to encourage an increase in remittances by Turkish migrant workers.

## PRODUCTION AND TRADE

Table 1 gives the production of primary minerals and processed metal and nonmetals, while tables 2 and 3 cover details of foreign trade, including total tonnages by commodities and destinations.

Turkey had one of the highest inflation rates of the Organization for Economic Cooperation and Development (OECD) countries, about 30% in 1974. Budgetary deficits of $2 billion, military expenditures engendered by the Cyprus problem, and credit restrictions to curb inflation indirectly contributed to a scarcity of capital and affected industrial production. The contribution of the mineral industry to exports was similar to that of the previous year.

## Table 1.—Turkey: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **METALS** | | | |
| Aluminum, bauxite | 471,342 | 352,100 | 664,909 |
| Antimony: | | | |
| Ore: | | | |
| Gross weight | 35,471 | 38,991 | 40,273 |
| Mine output, metal content | 3,724 | 4,094 | 4,229 |
| Regulus | 26 | 63 | 543 |
| Chromite ore (48% $Cr_2O_3$ content) thousand tons | 244 | 261 | 316 |
| Copper: | | | |
| Mine output, metal content | r 22,100 | 30,200 | 38,796 |
| Metal: | | | |
| Smelter output: | | | |
| Primary | 16,722 | 24,264 | 29,577 |
| Secondary | 375 | 450 | |
| Refined output | r 17,100 | 15,000 | 31,100 |
| Iron and steel: | | | |
| Iron ore, gross weight thousand tons | r 2,005 | 2,570 | 2,256 |
| Pig iron and ferroalloys: | | | |
| Ferrochromium e | 9,500 | 9,500 | 9,500 |
| Pig iron and other ferroalloys thousand tons | 1,135 | 896 | 1,200 |
| Crude steel (including castings) do | 1,442 | 1,163 | 1,458 |
| Lead: | | | |
| Mine output, metal content 1 | 5,860 | 8,922 | 4,602 |
| Smelter | 2,400 | 5,500 | 5,600 |
| Manganese ore, gross weight | r 15,072 | 3,708 | 3,240 |
| Mercury 76-pound flasks | r 7,861 | 8,731 | 8,681 |
| Zinc, mine output, metal content 2 | 19,348 | 24,500 | 36,025 |
| **NONMETALS** | | | |
| Abrasives, natural emery | 79,835 | 92,292 | 149,772 |
| Asbestos | 4,924 | 4,776 | 13,500 |
| Barite | 65,896 | 89,808 | 47,752 |
| Boron minerals | 622,444 | 525,588 | 1,038,588 |
| Cement, hydraulic thousand tons | 8,424 | 8,952 | 8,940 |
| Clays: | | | |
| Bentonite | e 5,000 | 7,814 | e 8,000 |
| Kaolin | e 20,000 | 23,967 | e 24,000 |
| Other | NA | 30,112 | 44,916 |
| Fertilizer materials, all types | 680,884 | 667,897 | 574,250 |
| Fluorspar | 2,311 | 1,935 | e 2,000 |
| Gypsum e thousand tons | 337 | 358 | 357 |
| Magnesite, crude ore | r 335,556 | 351,108 | 517,764 |
| Meerschaum kilograms | r 25,800 | 22,200 | 12,150 |
| Perlite | 30,417 | 17,329 | 15,608 |
| Pyrite, cupreous, gross weight | 77,062 | 43,530 | 76,249 |
| Salt, all types thousand tons | 430 | r e 500 | e 500 |
| Sodium sulfate | 30,213 | 36,838 | NA |
| Stone, sand and gravel, n.e.s.: | | | |
| Limestone: | | | |
| Dolomitic | NA | 336,793 | NA |
| Other | NA | 3 93,400 | NA |
| Marble | 4,753 | 1,209 | NA |
| Quartzite | NA | 114,113 | NA |
| Sand, siliceous | NA | 52,479 | NA |
| Shale (argillite) | NA | 13,929 | NA |
| Sulfur: | | | |
| Native, other than Frasch | 21,020 | 17,748 | e 18,500 |
| Content of pyrite | 35,880 | 20,268 | e 35,800 |
| Byproduct e | 29,000 | 29,200 | 29,000 |
| Total | 85,900 | 67,216 | e 83,300 |
| Wollastonite | NA | 10,295 | NA |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Ashpalt, natural thousand tons | 168 | 287 | 394 |
| Coal: | | | |
| Bituminous do | r 4,641 | 4,643 | 5,121 |
| Lignite do | r 7,374 | 7,476 | e 7,800 |
| Coke and semicoke: | | | |
| Metallurgical do | 1,284 | 1,280 | e 1,276 |
| Gashouse do | 45 | r e 28 | e 36 |
| Breeze do | 123 | e 120 | e 80 |
| Total do | r 1,452 | 1,428 | 1,392 |

See footnotes at end of table.

## Table 1.—Turkey: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | | |
| Gas, natural: | | | | |
| Gross production e | million cubic feet | 24,000 | 24,000 | 25,000 |
| Marketed production e | do | 5,000 | 5,000 | 5,000 |
| Petroleum: | | | | |
| Crude | thousand 42-gallon barrels | r 24,263 | 25,144 | 23,661 |
| Refinery products: | | | | |
| Gasoline | do | 12,885 | 16,426 | 16,454 |
| Jet fuel | do | 1,710 | 1,927 | 2,855 |
| Kerosine | do | 3,918 | 4,466 | 3,999 |
| Distillate fuel oil | do | 18,932 | 23,053 | 23,658 |
| Residual fuel oil | do | 31,236 | 37,759 | 36,537 |
| Lubricants | do | 338 | NA | 257 |
| Other: | | | | |
| Liquefied petroleum gas | do | 3,861 | 4,929 | 4,659 |
| Naphtha | do | 1,806 | 2,046 | 2,756 |
| Petroleum asphalt | do | 1,279 | 1,407 | 1,448 |
| Unspecified | do | 75 | 75 | 161 |
| Refinery fuel and losses | do | 3,959 | 3,483 | 1,896 |
| Total | do | 79,999 | 4 95,571 | 94,680 |

e Estimate. p Preliminary. r Revised. NA Not available.

1 Total content of material reported as run-of-mine lead ore and lead-zinc ore; excludes lead content of material reported as run-of-mine zinc ore.

2 Total content of material reported as run-of-mine zinc ore and lead-zinc ore; excludes zinc content of material reported as run-of-mine lead ore.

3 Does not include crushed limestone used in the manufacture of cement.

4 Total for listed figures only; does not include an estimate for lubricant production.

## Table 2.—Turkey: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Ore and concentrate | 150,000 | 144,620 | All to U.S.S.R. |
| Metal: | | | |
| Scrap | 50 | 100 | Do. |
| Unwrought | -- | 43,973 | Mainly to U.S.S.R. |
| Semimanufactures | 543 | 4,870 | U.S.S.R. 2,901; West Germany 568; Lebanon 417. |
| Antimony ore and concentrate | 3,278 | 5,069 | West Germany 1,849; Yugoslavia 1,778; United States 1,291. |
| Arsenic, natural sulfides | 2 | 3 | All to France. |
| Copper including alloys: | | | |
| Ore and concentrate | 5,560 | -- | |
| Unwrought | -- | 2,602 | Greece 1,000; Yugoslavia 992; Spain 610. |
| Semimanufactures | r 176 | 9 | Greece 3; West Germany 3. |
| Chromium ore and concentrate | 342,257 | 404,910 | United States 95,482; West Germany 49,110; Sweden 41,886. |
| Iron and steel: | | | |
| Ore and concentrate, including roasted pyrite | -- | 5,372 | All to West Germany. |
| Metal: | | | |
| Ferroalloys | r 12,591 | 20,547 | U.S.S.R. 10,250; Belgium-Luxembourg 2,540; Netherlands 1,775. |
| Semimanufactures | r 11,464 | 27,257 | Syria 8,121; Lebanon 7,712; West Germany 5,554. |
| Lead ore and concentrate | 11,351 | 8,390 | United Kingdom 3,185; Bulgaria 1,250; France 1,130. |
| Manganese ore and concentrate | -- | 520 | Spain 500. |
| Mercury 76-pound flasks | 8,478 | 8,011 | Netherlands 3,270; United Kingdom 2,165; United States 1,201. |
| Zinc: | | | |
| Ore and concentrate | 16,691 | 26,010 | Italy 9,600; Bulgaria 6,560; Switzerland 4,000. |
| Oxide | 485 | -- | |
| Metal, semimanufactures | 509 | 559 | Switzerland 503; West Germany 56. |
| Other: | | | |
| Ore and concentrate | 5,151 | 8,970 | United States 5,100; U.S.S.R. 2,520; Italy 1,250. |
| Ash and residue containing nonferrous metals | 627 | 587 | All to Netherlands. |
| Metals including alloys, all forms | 117 | 169 | Netherlands 80; Jordan 40; United States 39. |

## Table 2.—Turkey: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS | | | |
| Abrasives, natural | 75,043 | 64,209 | Netherlands 56,888; United States 6,045. |
| Barite | 38,243 | 110,530 | West Germany 40,571; U.S.S.R. 29,273; United States 22,180. |
| Boron materials: | | | |
| Crude natural borates | 148,574 | 355,124 | Italy 74,515; France 57,401; Japan 37,220; Switzerland 34,600. |
| Oxide and acid | 8,760 | 14,376 | West Germany 5,998; Japan 1,800; Netherlands 1,340. |
| Cement thousand tons | 1,362 | 980 | Israel 369; Syria 198; Libya 138. |
| Chalk | 649 | 522 | United Kingdom 330; Iran 140; Greece 46. |
| Clays and clay products: | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 491 | 2,020 | Lebanon 1,150; Italy 820. |
| Fire clay | -- | 45 | All to Iraq. |
| Fuller's earth, chamotte | -- | 50 | All to Syria. |
| Kaolin | 7,774 | 5,927 | Lebanon 5,705. |
| Other | 233 | 17 | Iraq 15; West Germany 2. |
| Products: | | | |
| Refractory | 1,841 | 3,158 | Iraq 1,580; Iran 1,374. |
| Nonrefractory | 911 | 5,674 | Netherlands 1,554; West Germany 1,377; Israel 1,037. |
| Diatomite and other infusorial earth | -- | 2 | All to Italy. |
| Feldspar | 1 | -- | |
| Lime | -- | 4,568 | All to Libya. |
| Magnesite: | | | |
| Crude | 8,190 | 8,550 | Austria 6,250; Yugoslavia 1,781. |
| Calcined | 65,218 | 73,444 | Austria 56,750. |
| Mica | 1 | -- | |
| Pyrite (gross weight) | 36,265 | 6,160 | All to West Germany. |
| Salt | 4 | 28 | All to Cyprus. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked, calcareous | 3,102 | 3,834 | Italy 2,083; Lebanon 1,178. |
| Worked | 26 | 16 | Switzerland 5; Cyprus 4. |
| Dolomite | -- | 27 | Libya 20; Greece 6. |
| Gravel and crushed rock | 498 | 50 | All to Israel. |
| Quartz and quartzite | 1 | 16 | All to Sweden. |
| Sand, excluding metal bearing | 500 | 1,000 | All to Greece. |
| Sulfur, sulfuric acid | -- | 26,025 | All to Switzerland. |
| Talc | 9 | 66 | Libya 20; United Kingdom 20; Greece 19. |
| Other nonmetals, n.e.s.: | | | |
| Crude, meerschaum, amber, jet | 4,118 | 8 | West Germany 6. |
| Slag, dross and similar waste, not metal bearing | 395 | 166 | All to Spain. |
| Oxides and hydroxides of magnesium, strontium, and barium | -- | 50 | All to Pakistan. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 705 | 1,529 | Israel 1,516. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt, natural | -- | 50 | All to Cyprus. |
| Coal, coke, briquets | -- | 600 | All to Iraq. |
| Hydrogen, helium, and rare gases | 5 | 11 | All to Israel. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 166 | -- | |
| Refinery products: | | | |
| Gasoline do | 3,497 | 3,192 | United States 1,200; West Germany 1,078; Greece 379. |
| Kerosine and jet fuel do | r 848 | 736 | Netherlands 274; Greece 108; United States 95. |
| Distillate fuel oil do | 1,408 | 1,257 | United States 507; Netherlands 147; Italy 139. |
| Residual fuel oil do | 1,403 | 749 | Italy 293; West Germany 228; Greece 228. |
| Other: | | | |
| Liquefied petroleum gas do | 15 | -- | |
| Unspecified do | 163 | 840 | Italy 245; Netherlands 240; United States 129. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 17,560 | 11,357 | All to Italy. |

r Revised.

## Table 3.—Turkey: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Oxide and hydroxide | 927 | 1,892 | U.S.S.R. 1,628; West Germany 113. |
| Metal: | | | |
| Unwrought | 31,559 | 40,363 | Switzerland 15,850; Canada 11,490; West Germany 7,039. |
| Semimanufactures | 10,454 | 6,711 | Spain 2,661; West Germany 1,424; France 801. |
| Arsenic trioxide, pentoxide, acids | 119 | 57 | West Germany 27; United Kingdom 18; France 12. |
| Cadmium metal including alloys, all forms | 10 | 8 | Belgium-Luxembourg 3; West Germany 2; Netherlands 2. |
| Chromium oxide and hydroxide | 229 | 201 | Italy 132; West Germany 20. |
| Cobalt: | | | |
| Oxide and hydroxide | 15 | 16 | Mainly from Belgium-Luxembourg. |
| Metal including alloys, all forms | 3 | 1 | Mainly from United States. |
| Copper: | | | |
| Ore and concentrate | 21,340 | 17,858 | Mexico 9,467; Australia 8,391. |
| Matte | -- | 399 | All from United Kingdom. |
| Metal: | | | |
| Scrap | -- | 456 | United Kingdom 281; France 94; Belgium-Luxembourg 73. |
| Unwrought | 119 | 5,073 | United Kingdom 3,390; Yugoslavia 868. |
| Semimanufactures | 1,109 | 6,076 | Belgium-Luxembourg 2,415; West Germany 2,060. |
| Iron and steel: | | | |
| Ore and concentrate thousand tons | 245 | 301 | Brazil 265; United States 36. |
| Metal: | | | |
| Scrap do | 109 | 187 | United States 158. |
| Pig iron, ferroalloys, similar materials do | r 132 | 173 | West Germany 83; Switzerland 39; U.S.S.R. 27. |
| Primary forms do | r 304 | 459 | West Germany 148; Switzerland 127; U.S.S.R. 78. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections do | r 62 | 141 | Yugoslavia 46; West Germany 38. |
| Universals, plates, sheets do | r 71 | 173 | Japan 60; Netherlands 49; West Germany 21. |
| Hoop and strip do | 4 | 8 | Japan 6; West Germany 1. |
| Rails and accessories do | 13 | 6 | France 4; Italy 1; U.S.S.R. 1. |
| Wire do | 7 | 3 | West Germany 1; Belgium-Luxembourg 1. |
| Tubes, pipes, fittings do | 31 | 38 | West Germany 10; U.S.S.R. 9; Belgium-Luxembourg 6. |
| Castings and forgings do | 2 | 1 | Mainly from France and Italy. |
| Lead metal including alloys: | | | |
| Scrap | 53 | 213 | United Kingdom 160; Denmark 23; Belgium-Luxembourg 20. |
| Unwrought | 6,590 | 4,415 | United Kingdom 2,552; Belgium-Luxembourg 1,379. |
| Semimanufactures | 491 | 17 | Italy 8; West Germany 4; France 3. |
| Magnesium metal including alloys: | | | |
| Unwrought | 2 | 41 | Norway 29; Switzerland 10. |
| Semimanufactures | 3 | (1) | Mainly from Switzerland. |
| Manganese: | | | |
| Ore and concentrate | 7 | 2,973 | France 1,843; Belgium-Luxembourg 1,009. |
| Oxides | 474 | 793 | Japan 386; West Germany 352. |
| Metal | 1 | 1 | All from West Germany. |
| Nickel: | | | |
| Matte, speiss, similar materials | r 161 | 256 | United Kingdom 144; Netherlands 51; Cuba 30. |
| Semimanufactures | r 209 | 114 | West Germany 53; Austria 13; United Kingdom 13. |
| Platinum-group metals and silver metals including alloys: | | | |
| Platinum group troy ounces | 28,228 | 8,359 | Austria 7,652; West Germany 707. |
| Silver do | 26,042 | 46,297 | West Germany 42,921. |

See footnotes at end of table.

## Table 3.—Turkey: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Tin: | | | |
| Oxides ---- long tons -- | 2 | 12 | Mainly from West Germany. |
| Metal including alloys, all forms ---- do ---- | 693 | 1,351 | Switzerland 678; United States 361; Belgium-Luxembourg 128. |
| Titanium: | | | |
| Ore and concentrate | 2,612 | 655 | Australia 405; United Kingdom 250. |
| Oxides | 2,206 | 2,293 | France 704; West Germany 545; United Kingdom 312; Czechoslovakia 265. |
| Zinc: | | | |
| Oxide | 3,003 | 4,974 | Lebanon 1,583; Netherlands 1,234; West Germany 929; France 516. |
| Metal including alloys: | | | |
| Unwrought | 17,142 | 13,490 | West Germany 9,747; Belgium-Luxembourg 2,805. |
| Semimanufactures | 536 | 541 | West Germany 247; Belgium-Luxembourg 175; U.S.S.R. 50. |
| Zirconium ore and concentrate | -- | 94 | Australia 61; Netherlands 33. |
| Other: | | | |
| Ores and concentrates, n.e.s | -- | 30 | All from West Germany. |
| Ash and residue containing nonferrous metals | -- | 201 | United Kingdom 101; Republic of South Africa 100. |
| Oxides, hydroxides, peroxides of metals, n.e.s | 630 | 136 | West Germany 81; Belgium-Luxembourg 17. |
| Metals including alloys, all forms: | | | |
| Alkali, alkaline earth, rare-earth metals | 2 | 5 | Mainly from France. |
| Base metals including alloys, all forms, n.e.s | 6 | 5 | West Germany 3; Netherlands 1. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Crude | 3 | (1) | All from United Kingdom. |
| Dust and powder of precious and semiprecious stones ---- value -- | $80,180 | $67,098 | Netherlands $65,650. |
| Grinding and polishing wheels and stones | 759 | 910 | Norway 144; West Germany 137; Italy 107. |
| Asbestos, crude | 11,577 | 9,881 | Canada 5,185; U.S.S.R. 1,484; United Kingdom 1,481. |
| Cement | r 1,463 | 1,412 | Italy 886; West Germany 431. |
| Clays and clay products: | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 193 | 148 | West Germany 141. |
| Fuller's earth, chamotte | 247 | 57 | U.S.S.R. 55. |
| Kaolin | 4,322 | 37 | United Kingdom 32. |
| Other | 332 | 473 | West Germany 237; Netherlands 187. |
| Products: | | | |
| Refractory (including nonclay bricks) | r 53,770 | 63,681 | U.S.S.R. 42,919; Austria 9,893; West Germany 4,254. |
| Nonrefractory | r 2,183 | 596 | West Germany 426. |
| Diamond, industrial - thousand carats -- | 115 | 225 | West Germany 160; Netherlands 30; United Kingdom 25. |
| Diatomite and other infusorial earth | 306 | 274 | West Germany 170; Italy 66. |
| Feldspar | 68 | 22 | Belgium-Luxembourg 11; West Germany 10. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 10,650 | 19,756 | West Germany 10,009; Switzerland 3,539; U.S.S.R. 3,468. |
| Phosphatic | 360,658 | 329,231 | Tunisia 142,622; Jordan 136,423. |
| Manufactured: | | | |
| Nitrogenous | 650,929 | 847,253 | Italy 275,359; Netherlands 251,383; West Germany 109,569. |
| Phosphatic | 2,596 | 62,395 | Switzerland 21,200; Greece 17,605; Lebanon 14,652. |
| Potassic | 16,276 | 78 | Israel 50; West Germany 27. |
| Other | 528,928 | 800,444 | West Germany 141,376; Italy 123,503; France 107,243. |

See footnotes at end of table.

## Table 3.—Turkey: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fluorspar | 2,347 | 1,176 | United States 1,066. |
| Graphite, natural | 355 | 522 | West Germany 312; Canada 109; Norway 60. |
| Lime | -- | 80 | All from West Germany. |
| Magnesite | -- | 189 | Mainly from U.S.S.R. |
| Mica: | | | |
| Crude | 6 | 41 | West Germany 35; United Kingdom 6. |
| Worked | 37 | 24 | Spain 19; United States 2; United Kingdom 2. |
| Pigments, mineral | r 228 | 206 | West Germany 201. |
| Precious and semiprecious stones, except diamond, manufactured -- kilograms -- | 2,036 | 1,527 | East Germany 1,351; Switzerland 161. |
| Pyrite (gross weight) | 135,675 | 127,460 | Cyprus 91,948; United Kingdom 22,062; Switzerland 13,450. |
| Salt | 14 | 35 | France 15; West Germany 14. |
| Sodium and potassium compounds: | | | |
| Caustic soda | 27,466 | 24,865 | Italy 14,087; Switzerland 3,890; Canada 3,145. |
| Caustic potash | 805 | 422 | Italy 275; United Kingdom 75; France 36. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | -- | 3 | All from West Germany. |
| Worked | 2 | -- | |
| Dolomite | -- | 27 | All from West Germany. |
| Gravel and crushed rock | 300 | 2,358 | Mainly from United Kingdom. |
| Quartz and quartzite | 339 | 368 | Netherlands 150; West Germany 105. |
| Sand, excluding metal bearing | 11 | 11 | Belgium-Luxembourg 10. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 3 | 26,260 | Switzerland 18,873; France 6,880. |
| Colloidal | 51 | 92 | France 57; West Germany 35. |
| Sulfuric acid | 61,439 | 12,730 | Mainly from Switzerland. |
| Talc | 327 | 390 | Italy 245; France 125. |
| Other: | | | |
| Crude | (1) | 21 | Mainly from West Germany. |
| Oxides and hydroxides of magnesium, strontium, and barium | 141 | 141 | Italy 57; United Kingdom 44; United States 21. |
| Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s | 153 | 1,184 | U.S.S.R. 1,171. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 2 | 2,534 | United Kingdom 2,504. |
| Carbon black | 15,688 | 16,433 | Italy 10,178; Israel 2,362; West Germany 2,018. |
| Coal and coke, including briquets | 9,957 | 23,926 | U.S.S.R. 15,975; Belgium-Luxembourg 6,257. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | r 49,896 | 53,286 | Saudi Arabia 22,559; Iraq 9,707; Iran 5,728. |
| Refinery products: | | | |
| Gasoline ---- do | 281 | 47 | United Kingdom 23; Italy 21. |
| Kerosine and jet fuel -- do | 208 | 21 | Italy 14; Belgium-Luxembourg 4; Romania 3. |
| Distillate fuel oil ---- do | 1,401 | -- | |
| Residual fuel oil ---- do | 1,608 | 744 | Italy 363; Lebanon 277; France 103. |
| Lubricants ---- do | r 1,175 | 985 | United States 332; United Kingdom 262; France 140. |
| Other: | | | |
| Liquefied petroleum gas ---- do | 37 | 58 | Mainly from Italy. |
| Mineral jelly and wax ---- do | 34 | 34 | West Germany 22; Romania 5; France 4. |
| Unspecified ---- do | r 1 | 17 | U.S.S.R. 14. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 1,774 | 813 | Belgium-Luxembourg 425; Yugoslavia 298. |

r Revised.
1 Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Aluminum.**—The integrated aluminum plant at Seydisehir operated below capacity during the year owing, for the most part, to a power shortage. The shortage resulted when the power grid of the Kaban hydroelectric plant, from which the plant draws its power, was not completed as scheduled by yearend 1974. Total capacity of the Seydisehir complex when completed will be 200,000 tons of aluminum ingot, and 60,000 tons of aluminum billets, beams, plates, and foil. Feed for the complex in 1974 came from the bauxite mines of Murtas and Dogankuza.

Bauxite production was 664,909 tons, of which one-third was exported to the U.S.S.R. as concentrate and one-third was converted to alumina and then was exported to the U.S.S.R. for partial payment of the Seydisehir integrated plant. The U.S.S.R. provided $62 million for the financing of the plant in 1972. The remaining one-third of bauxite production was converted to alumina for domestic consumption.

**Chromite.**—The improved price structure of chromite on the international scene brought a significant improvement to the chromite industry of Turkey in 1974. Aside from 40,000 tons of chromite consumed in the Antalya ferrochrome plant, Turkey exported most of its production, mainly to Japan, Europe, and a limited amount to the United States.

Etibank's Antalya ferrochrome plant produced at full capacity, whereas the ferrochrome plant at Elâzig, financed by a Japanese credit, remained under construction. The Elâzig ferrochrome plant was scheduled to start production in 1977 with a 50,000-ton capacity. However, due to strong demand for ferrochromium, Etibank was giving serious consideration to expansion of the plant capacity before full production in 1977.

The production of chromite ore increased 21% in 1974 compared with 1973 output. Etibank, the largest producer in the country, provided 45% of the export tonnage. Most of the production was from Etibank's eastern mine. The Kafdagi mine and the concentrator of Etibank near Elâzig were scheduled to start production the latter part of 1975. Targeted production of this mine was given at 124,000 tons per year of 48% chrome ore.

**Copper.**—Production of blister copper in Turkey increased 20% in 1974, when compared with 1973 output. The sulfuric acid plant of Karadeniz Bakir Isletmeleri A.S. (KBI), because of malfunctioning electrostatic precipitators, was not in operation in 1973 and functioned only on a limited scale in 1974. According to reports of the Maden Tetkik ve Arama Enstitüsü (MTA), the Mineral Research and Exploration Institute of Turkey, although there were 600 known copper occurrences in Turkey, the country's total copper production came from only 10 operating mines. Etibank produced blister copper and copper pyrite, while KBI and the Black Sea Copper Co., owned 49% by Etibank and remainder by private Turkish banks, produced blister copper and sulfuric acid. KBI's major facilities, located mostly in the north and northeastern sections of Turkey, included the following: (1) The Çakmakkaya open pit mine with daily production of 6,000 tons; the Damar open pit mine, with daily production of 5,000 tons; and the Çakmakkaya concentrator, with a milling capacity of 9,000 tons per day. (2) The Çakmakkaya-Hopa filtering slurry pipeline consisting of two 62-kilometer pipelines, one for transporting copper concentrate and the other for pyrite concentrate; and filtering, drying, and shiploading facilities located at Hopa, a port on the Black Sea. (3) The Bakibaba-Kur underground mine with production capacity of 300 tons per day of high-grade copper ore and 300 tons per day of copper pyrite. (4) The Lahanos-Espiye underground mine and the Kizilkaya-Espiye open pit mine which were under active exploration during 1974. (5) The Samsun flash copper smelter, 16 kilometers inland from the port of Samsun which could produce yearly 41,000 tons of blister copper, and 365,000 tons of sulfuric acid, and includes a slag cleaning plant with 8,000-tons-per-day capacity. In addition, the smelter when in full operation was to yield 11,000 troy ounces of gold and 210,000 troy ounces of silver per year.

**Iron Ore.**—Iron ore production decreased 12% in 1974 compared with 1973 output. High-grade iron ore from Divrigi mine supplied both the Karabük and Eregli

steel plants. Tenders for the beneficiation plant proposed for low-grade Divrigi iron ore were issued during the year. The proposed plant was to beneficiate and pelletize the sulfureous magnetite ores of central-eastern Turkey for use in steel mills.

**Iron and Steel.**—Production of crude steel including cast and pig iron increased 29% in 1974 compared with 1973 figures. The increase was due to expansions at the Karabük steel mill as well as new units that became operational at the Eregli steel mill in 1974.

According to projections made by the Turkish Planning Organization (TPO), steel production in Turkey was expected to increase from 2.1 million tons in 1975 to 2.24 million tons in 1990. The increase was expected to result from completion of the Iskenderun integrated steelworks and two new steel mills to be built near Adapazari. The Iskenderun steel mill was expected to begin partial production by 1976. The Adapazari mill, under feasibility study, was expected to reach partial production by 1989. However, construction of the Iskenderun steel mill was delayed in 1974 pending discussion of the proposed increase in capacity from 1 million to 2 million tons and completion of a feasibility study of supplying coke for such an expansion.

International Finance Corp. (IFC) approved a $3.6 million loan and a $430,000 equity investment in Borusan Gemlik Boru Tessisleri, A.S., to help finance a 130,000-ton-per-year steel tube plant in northern Turkey. The entire cost of the plant, to produce ½- to 4-inch-diameter black and galvanized tubes, mostly for domestic consumption, was estimated at $10 million.

**Lead and Zinc.**—Cinko-Kursun Metal Sanayii A.S. of Turkey (CINKUR), owned 47% by Etibank and the remainder by private investors, continued its mining activities in the Zamanti Valley. Also, CINKUR's lead-zinc smelter in Kayseri was nearing completion in 1974. A feasibility study for this smelter project was started in late 1971 by Surveyer, Nemiger, and Chenevert, Inc. (SNC), and in 1972, a substantial loan for its construction was obtained from the Economic Development Corporation (EDC). The upper oxidized zone of the ore body contained zinc carbonate grading 10% to 50% zinc. The entire ore body, including lower grades, was estimated at 3.5 million tons. The lead-zinc smelter was to process 238,000 tons per year of mixed ore and was to produce 40,000 tons of zinc and zinc products, 125 tons of cadmium, and 6,000 tons of lead. All of the engineering, procurement, and construction management was under SNC's supervision, and Allis-Chalmers Co. of Canada and KHD Industrieanlagen A.G. of West Germany supplied the equipment for the smelter and mining. The full operation of mine and smelter was originally expected in early 1975. However, owing to financial problems, this date was postponed to 1976.

Production of lead and zinc in 1974 was 22% higher than that in 1973.

**Mercury.**—Etibank's exploration of its newly acquired concession of 1,000 hectares near Bolali, Usak Province, continued during 1974, but no new findings were reported. Production of mercury decreased 1% in 1974 compared with 1973 output. Though export values were higher during 1974 than those of 1973, the export volume decreased because of governmental restrictions and a decrease in mercury consumption.

**Tungsten.**—Etibank's mine development plan and construction of a concentrator at the Uludag tungsten deposit met difficulties in the latter part of 1974. A fire broke out in some of the developed tunnels of the mine and forced a delay of several weeks. Etibank had earmarked an investment of about $26 million for the entire project. The concentrator was designed to treat scheelite, the typical type of ore found in the Uludag deposit, at a rate of 560,000 tons per year, and to produce 3,000 tons of concentrate containing 65% $WO_3$. Because of the delays, Etibank rescheduled initial operation of concentrator for mid-1976 or 1977.

**Uranium.**—Management of Etibank announced establishment of a small pilot plant to process and enrich uranium ore in western Turkey, where known reserves of uranium ore were given at 4,000 tons. The information on the grade of the ore was not available.

## NONMETALS

**Barite.**—Barit Maden Turk A.S. (BMT) exported 65,000 tons of barite in 1974, 41.2% less than 1973 exports. The decrease was due to governmental decisions on exports rather than to declining produc-

tion at the mine. Most of 1974 barite exports were to oil-producing nations of the Middle East, and some was exported to Japan and the United States. Management of BMT announced in 1974 that a grinding plant was soon to be installed at the mine site. However, details of plant capacity and startup date were not available at yearend 1974.

**Boron.**—Turkey remained one of the world's leading boron producers in 1974. Etibank, the state-owned organization, held concession rights to about 12,000 square kilometers. The rights entitled Etibank to explore for and exploit not only borate minerals, but also copper, chromite, sulfur, and mercury.

Turkish boron deposits usually are associated with shales, marls, and occasionally bentonite, and as a minor mineralization in volcanic tuffs. Prior to the 1973 construction of Etibank's clay-washing plant in Kirka, most Turkish boron ore was upgraded by hand. By the end of 1974, the capacity of the clay washing plant reached 850,000 tons per year.

The amended "bill for mining reform," which proposed specific rules and regulations for future foreign investors in the borate industry, remained in parliamentary committee, and no action had been taken by yearend 1974. Under the proposed bill, a foreign company would not be allowed to obtain an exploration license but could participate with a Turkish license-holder. Also, Turkish authorities were to decide which boron deposits were to be exploited by the State organization and which deposits could be operated as a joint venture. Other major companies involved in borate production in 1974 were the Mortas-Bortas group, Rosih ve Ihsan A.S.; and Ali Sayacki.

**Celestite.**—BMT successfully produced and marketed celestite during 1974. Celestite deposits, located about 15 kilometers south of Sivas, were found to be of high strontium content. Samples of shipments dried at 100° C had the following analysis: Strontium sulfate 97.1%, barium sulfate 0.54%, calcium sulfate 1.21%, and other 1.15%. BMT exported 10,000 tons of ore to western and eastern European countries and Japan during 1974. The mine production capacity was given as 200 tons per day. Officials of BMT were optimistic about future production of celestite in Turkey because of the ore's high grade.

**Fertilizer.**—Although plant construction during the second 5-year plan did add some nitrogenous fertilizer capacity to that already in existance at Kütahya and Karabük, production by no means met demand in 1974. During the third 5-year plan (1973-77), fertilizer capacity was to be expanded. The fertilizer capacity for 1972 and the estimated fertilizer capacity for 1977 are as follows, in thousand tons per annum product:

| | 1972 | 1977 |
|---|---|---|
| Ammonium sulfate | 68 | 168 |
| Ammonium nitrate | 935.5 | 1,588.5 |
| Urea | -- | 274 |
| Single superphosphate | 422 | 522 |
| Triple superphosphate | 320 | 400 |
| Diammonium phosphate | 150 | 520 |

To implement the new capacity, planners had allocated an investment of about $500 million for new construction and expansion purposes.

Turkish imports of fertilizers during 1974 were over 50% less than the record levels of 1973. Decreased imports of fertilizer were reflected in consumption as 11% less nitrogen and 22% less phosphate were consumed in 1974 than were consumed in 1973. However, with economic recovery foreseen in 1975, fertilizer consumption was expected to recover, resulting in the demand for nitrogen products rising to 450,000 tons of nitrogen as compared with 380,000 tons in 1974 and 430,000 tons in 1973.

Producers of fertilizers in Turkey anticipated overcoming production problems in existing plants and with the expansion of facilities coming onstream in 1975 to eventually eliminate Turkish dependence on foreign fertilizer resources.

Etibank's phosphate mining remained on a limited scale while the company experimented to find the most economical and efficient beneficiation technique. Etibank officials reported reserves of 400 million tons of ore of mixed grade ranging from 30% $P_2O_5$ to 10% $P_2O_5$. Most of the phosphate deposits were located in the Mazidag area, in southeastern Turkey.

New discoveries of phosphate were reported in southeast Turkey at Bogazkerim near Kilis on the Syrian border in 1974. Reportedly, the deposits were large, and small-scale mining had begun during the year.

**Magnesite.**—Magnesite production in 1974 was 47.5% higher than the 1973 output. Most of the production was from the Eskisehir and Kütahya mines. The Tavsanli deposits were still under development in 1974. Construction of a dead-burned magnesite plant, belonging to Kütahya Manyesit Isletmeleri A.S. (KUMAS), continued in 1974. The plant was designed to produce 80,000 tons of refractory-grade MgO per year. The main producer of dead-burned magnesite was Magnesite Anonim Sirketi Magnent Ltd. Most of their production was exported to European countries and Japan.

**Perlite.**—Perlite production during the year decreased 10% compared with 1973 output. Perlite producers were looking for an effective international market in the future. According to the MTA's report, perlite deposits contained large reserves and were very accessible for shipping to overseas markets.

**Pyrite.**—Cupreous pyrite production was 75% higher than the 1973 output. The increase was attributed to intensive mining activities in copper mines along the Black Sea coast. Most of the cupreous pyrite was exported to West Germany in exchange for copper metal or other commodities needed in the Turkish economy.

## MINERAL FUELS

MTA's geophysical and geological mapping program started in 1963. Drilling yielded geothermal indications at four localities in Turkey. In 1965, Kizildere near Denizli was discovered, and in 1966, the United Nations drilled 15 holes ranging in depth from 400 to 800 meters. Hot water containing 10% to 15% steam was produced at the surface, and wellhead pressures ranged from 5 to 50 atmospheres. The maximum measured temperature of water produced at the wellhead was 200° C. Because of high contamination with calcium and boron elements, large-scale production and exploitation was delayed; more research and study was needed to overcome this handicap.

The next area of interest was in the vicinity of Afyon, where a well drilled by MTA to a depth of 200 meters encountered steam under high pressure and the well blew-out. MTA succeeded in terminating the blow-out by drilling a side-well and injecting cold water. The measured temperature of the aquifer was reported at 140° C.

The third geothermal area was at Seferihisar, south of Izmir on the Aegean Sea. Natural hot springs occur there, and the geological and geophysical surveys by MTA indicated favorable conditions. One shallow-temperature gradient well encountered steam at a depth of 60 meters. A 1,000-meter hole was scheduled to be drilled in the vicinity, but the time was not specified.

The fourth area surveyed by MTA was in the Kizilcahaman section. It is a broad basin extending 70 kilometers north and 40 kilometers northeast of Ankara, with numerous hot spring occurrences. A 2,000-meter well was started in 1973 with the expectation that sufficient hot acquifer would be encountered to permit utilization by the city of Ankara. Further details of the drilling program were not available at the end of 1974.

The major aim of MTA activities in all these areas was (1) To determine if natural hot water could be utilized economically to heat an entire city; (2) to expand the use of natural hot waters for heating cities such as Ankara, since Turkish lignite produces an excessive amount of pollution; (3) to utilize natural hot water in heating greenhouses to increase food supply; and (4) to develop electric power from geothermal energy. Although limited machinery and funds hindered MTA's program in 1974, it was planned to add a second drilling rig and to extend exploration activities to eastern Turkey.

After Norway, Turkey possessed the greatest hydroelectric potential in Europe in 1974, about 430,000 gigawatts. However, only 7% of this potential had been put to use by the end of the year. Average power consumption per inhabitant was reported to be 333 kilowatt-hours. Turkey brought into partial operation one of the country's largest hydroelectric projects, Kaban dam in 1974. The Kaban dam located on the upper course of the Euphrates River, lies about 600 air kilometers east of Ankara, in a location where the Anatolian plateau is at an altitude of 1,300 meters.

The Kaban installation was expected to influence Turkey's entire economic development since it was to provide a sizable quantity of energy for the industrial centers in northwestern Anatolia through

a 380-kilovolt line and for the consumer centers in eastern and southeastern Anatolia, which were to be serviced by by a 150-kilovolt line. The project supplied energy for the Seydisehir aluminum plant, Guleman ferrochrome plant, Divrigi iron and Maden copper mines.

**Coal.**—Plans for the Elbistan lignite project, including an opencast mine and a thermal powerplant, progressed in 1974. The powerplant was to be administered by Türkiye Elektrik Kurum Genel Müdürlügü (TEK) (Turkish Electric Power Directorate General) and the lignite mining operation and overall project administration responsibilites were to be by Türkiye Kömür Isletmeleri Kurum Genel Mudurlugu (TKI) (Turkish Coal Works Directorate General.) Cost of the entire project was estimated at $500 million. The Elbistan lignite deposit was estimated to contain approximately 3 billion tons of lignite with an overburden thickness ranging from 60 to 100 meters. The workable lignite seams reportedly averaged 40 meters, and the calorific value of the coal ranged from 800 to 1,600 kilocalories per kilogram, which was regarded as comparatively low. TKI planned to mine 20 million tons of lignite per year, of which 17.5 million tons were earmarked for power generation and 2.5 million tons were designated for domestic fuel requirements. The loans for the entire project were obtained from the World Bank, the European Investment Bank, France, West Germany, and Italy. Initial production of lignite was scheduled for 1978 to coincide with completion of the thermal plant. The plant was designed to have four 300-million-watt units with the following basic accessories: Boiler plant, turbogenerator sets, cooling systems, piping and condensation systems, instrumentation and control equipment, transformers, and a low-voltage system. In addition to these systems, other units such as coal handling and ash removal equipment, cranes and workshop facilities, water supply and auxiliary cooling units, and switchyard machinery were to be installed. The net capacity of the project was envisaged to be 1,048 megawatts, at a cost of $1 billion.

Bituminous coal production of Turkey, by both private and public sectors increased 8% in 1974 compared with 1973 output, while the lignite production in both sectors remained almost the same. Coke production increased 29% in 1974 while sales decreased 21% when compared with 1973 figures. Data on consumption were not available, but data on sales were published. Inasmuch as imports and exports were insignificant and changes in stocks were minimal, consumption was approximately equivalent to sales of unwashed coal and lignite to production of coke as shown below, in thousand tons:

| | Production [1] | | Sales [2] | |
|---|---|---|---|---|
| | 1973 | 1974 | 1973 | 1974 |
| Bituminous coal (ungraded): | | | | |
| Public sector | 7,841 | 8,506 | [3] 4,465 | [3] 4,704 |
| Private sector | 9 | 5 | 8 | 4 |
| Total | 7,850 | 8,511 | 4,473 | 4,708 |
| Lignite (ungraded): | | | | |
| Public sector | 7,537 | 7,666 | 4,806 | 5,382 |
| Private sector | 3,028 | 2,507 | 3,000 | 2,500 |
| Total | 10,565 | 10,273 | 7,806 | 7,882 |
| Coke [4] | 940 | 1,214 | 808 | 640 |

[1] Data do not agree with that shown on table 1 because of difference in source: Turkiye Komur Isletmeleri Kurmumu, 1974, p. 9.
[2] Sales figures were given in lieu of consumption.
[3] Washed product.
[4] Country's total production and sales, including public and private sector.

**Petroleum.**—*Exploration.*—In the face of the world oil crisis and rapidly rising oil prices, oil exploration requests were accelerated. It was decided by TPAO to increase the depth of producing oil wells from 4,500 meters to 6,000 meters. TPAO's activities were concentrated in the area of Tuz Lake, where exploratory wells 15 years old were proven negative; in the northern sector of Siirt Province; in the area of Murat River; and in the provinces of Adana, Aidyaman, and Erzurum. TPAO decided to drill 24 new wells in Turkish Trace where it recently had discovered a high-quality crude. TPAO's activity continued near Gaziantep, Nuraylin, and Cizre in southwestern Turkey.

Additional exploration licenses were obtained for offshore exploration in the Aegean and in the Mediterranean Seas. However, considerable tension was building up in both Greece and Turkey with respect to offshore drilling in the area, due to disputes over seabed boundary rights between the two nations. By yearend, no solution was found although both countries were working on the problem.

In 1974, Aladdin Middle East Ltd. discovered petroleum in Region V, a main oil producing area of Turkey. The find was a rather light oil with specific gravity of 22° API. By yearend, more geological and seismographic work was done, and more drilling on the concession was scheduled for 1975.

*Production.*—According to the Association of Turkish Petroleum Geologists, TPAO produced 20,000 of the 65,000 barrels of crude oil per day in Turkey. Other producers were Shell Company of Turkey Ltd. 39,000 barrels; Mobil Exploration Mediterranean Inc. 7,800 barrels; and the Ersan Petrol Sanayii A.S. 720 barrels per day. Salient production statistics on oilfields in Turkey are as follow:

| Name of field and discovery date | Number of wells | | | | | Production in barrels | | Gravity API |
|---|---|---|---|---|---|---|---|---|
| | Depth (feet) | Flowing | Pumping | Gas lift | Shut in | Daily average 1st 6 months of 1974 | Cumulative July 1, 1974 | |
| Ersan: Kahta, 1958 | 3,500 | -- | 5 | -- | 1 | 721 | 3,446,651 | 11.5 |
| Mobil: | | | | | | | | |
| Bulgurdag, 1960 | 6,500 | -- | 1 | -- | 2 | 102 | 2,203,000 | 39.0 |
| Selmo, 1964 | 5,800 | 2 | 10 | 2 | 2 | 8,542 | 36,286,785 | 34.4 |
| Shell: | | | | | | | | |
| Barbes, 1972 | 7,200 | 6 | -- | -- | 1 | 4,897 | 3,310,512 | 29.6 |
| Beykan, 1964 | 5,200 | 13 | -- | -- | 4 | 11,039 | 36,323,667 | 33.2 |
| Katin, 1971 | 6,800 | 2 | -- | -- | 1 | 1,767 | 1,497,369 | 29.5 |
| Kayakoy, 1961 | 6,000 | 5 | -- | -- | 2 | 1,934 | 8,285,208 | 38.2 |
| Kayakoy West, 1964 | 5,300 | 4 | -- | -- | 3 | 3,341 | 11,959,801 | 34.0 |
| Kurkan, 1963 | 4,500 | 8 | -- | -- | 1 | 9,435 | 28,201,015 | 31.4 |
| Malatepe, 1970 | 5,000 | 4 | -- | -- | 1 | 867 | 2,251,492 | 32.7 |
| Malatepe W. | -- | -- | -- | -- | -- | 859 | -- | 31.3 |
| Piyanko, 1968 | 6,300 | 1 | -- | -- | -- | 279 | 938,726 | 35.5 |
| Sahaban-Kurkan So., 1967 | 5,500 | 6 | -- | -- | -- | 2,153 | 10,752,171 | 34.7 |
| Others | -- | 2 | -- | -- | -- | 176 | 43,357 | -- |
| TPAO:[e] | | | | | | | | |
| Adiyaman, 1971 | 5,600 | -- | 12 | -- | 2 | 2,745 | 2,585,590 | 26.6 |
| Garzan-Germik, 1951 | 5,100 | -- | 38 | -- | 32 | 2,974 | 26,346,869 | 25.0 |
| Magrip, 1961 | 6,400 | -- | 13 | -- | 12 | 1,161 | 11,212,275 | 19.3 |
| Raman, 1940 | 4,500 | -- | 24 | -- | 23 | 3,005 | 21,460,854 | 18.5 |
| Raman West, 1961 | 4,300 | -- | 126 | -- | 12 | 4,689 | 18,960,191 | 13.4 |
| Saricak, 1973 | -- | 4 | -- | -- | -- | 2,100 | 765,000 | 31.5 |
| Silivanka, 1962 | 7,500 | -- | 14 | -- | 1 | 1,547 | 3,244,058 | 19.6 |
| Yenikoy, 1973 | -- | 8 | -- | -- | -- | 551 | 200,000 | 31.0 |
| Others | -- | -- | 6 | -- | -- | 412 | 2,784,625 | -- |
| Total Turkey | | 65 | 249 | 2 | 100 | 65,296 | 233,059,216 | |

[e] Estimate.

Source: The Oil and Gas Journal. V. 72, No. 52, Dec. 30, 1974, p. 146.

# The Mineral Industry of the U.S.S.R.[1]

By V. V. Strishkov [2]

The U.S.S.R., with a centrally planned economy and low-wage labor, is the world's second largest producer of industrial products. It is the leading producer of petroleum, iron ore, manganese ore, chromium, potassium salts, phosphates, and cement. It holds second place in the production of steel, gold, natural gas, aluminum, fluorite, and platinum-group metals, and it is one of the leading producers of copper, nickel, lead, zinc, tungsten, molybdenum, mercury, and native sulfur.

Compared with 1973 figures, the following increases, in million tons, have been reported: Raw coal and lignite—16.9; oil (including condensate)—29.9; iron ore—8.8; pig iron—3.9; crude steel—4.7; finished rolled, ferrous metals—2.8; steel pipe—0.6; mineral fertilizers—1.9 (100% content); and cement—5.6. Electric power output increased 60 billion kilowatt hours. There were also increases in the output of nonferrous, rare, and precious metals, refined petroleum products, and nonmetallic minerals. In 1974 the annual plan for production of many mineral products was met, but rolled ferrous metals, steel pipe, aluminum, and nickel production failed to meet even the reduced growth rate set for 1974.

Despite impressive gains in mineral production, as reported in the Soviet press, there have been consistent reports of the failure of mineral commodities to reach planned goals and to supply industrial needs.

The Soviet ferrous and nonferrous industries employed over 3 million workers;[3] the ferrous industry alone accounted for about 2 million "production" workers and some 75,000 university graduate engineers and 125,000 graduate technicians. There were over 2 million employees in the coal industry, including 61,500 university graduate engineers and 141,000 technicians. The oil, gas, and petrochemical industries employed 2.6 million, including over 250,000 in the development of oilfields and gasfields.[4]

Equipment used in Soviet mineral industry is standard and of the type made earlier in Western Europe and in the United States. The manufacture of mining equipment has increased substantially, but the technical standards and the quality of the equipment have fallen short of planned goals. Equipment manufacturing plants have been criticized in the Soviet press [5] for the poor quality of their products. Some enterprises produce only products that are "profitable" for them and pay little attention to the needs of the State.[6] When considering the growth of Soviet mineral production, it must be remembered that mineral industry output has grown because the country has natural resources, manpower, and favorable geographical and climatic conditions.

Despite the expansion of the Soviet mineral industry, supply has not kept up with demand and there have been chronic mineral and fuel shortages, particularly in the European part of the U.S.S.R. The Soviet economy sustains immense losses each year as a result of insufficient output and underutilization of energy and metals.

[1] This publication is based on a review of the sources published by the U.S.S.R.

[2] Mining engineer, Division of Coal.

[3] Metallurg (Metallurgy), Moscow. No. 7, July 1974, p. 1.

[4] Trud (Labor), Moscow. July 15, 1973, p. 1. Planovoye knozyaystvo (Planned Economy), Moscow. No. 1, January 1974, p. 32. Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 6, February 1975, p. 1.

[5] Sotsialisticheskaya industriya (Socialist Industry), Moscow. July 7, 1972. Sovetskiy shakhter (Soviet Miner), Moscow. No. 10, October 1973. Ugol' (Coal), Moscow. No. 1, January 1974.

[6] Pravda, Moscow. Dec. 28, 1973, p 1.

Over 5,000 deposits of various minerals were being exploited in 1974. Extensive prospecting and exploration for practically all commodities was carried out on a large scale. There were over 500,000 employees in the geological and prospecting organizations of the U.S.S.R. in 1974, including 63,000 graduate specialists with university education and over 53,000 graduate technicians. A total of over 3 billion rubles was allocated for geological exploration in 1974, 8% more than in 1973.[7] About 52% of all funds was for oil and gas exploration and 5% for exploration for coal deposits. Over 2,500 geological and geophysical teams are permanently employed in the prospecting and exploration of oilfields and gasfields, and about 2,200 exploratory wells are completed each year, using some 2,500 drilling rigs. Drilling footage on oil and gas increased from 9.1 million meters in 1963 to 13.6 million meters in 1973. In 1974, 14.5 million meters were planned.[8]

In many instances, the exploration program has not substantially improved the U.S.S.R.'s reserve position. This is particularly true of nonferrous metals, rare metals, and gold. There are shortages of bauxite, copper (Urals), nickel (Kola Peninsula), mercury (Ukraine), and lead (Central Asia).

The main purpose of recent Soviet mineral exploration has been to improve the distribution of the raw material reserves for the production of major metals, all fuels, and many nonmetallic minerals. However, during the past 10 years, no increment in tin reserves has been achieved even in the Soviet Far East. Poor results were also reported in the growth of reserves of bauxite, lead, zinc, mercury, tungsten, antimony, and nickel (Kola Peninsula).[9] Good results were obtained in increasing the quantity and quality (by 50%) of copper-nickel reserves in the Norilsk area, where 20 teams of geologists were employed in 1974.

More than 300 scientists and specialists were assigned to carry out fieldwork with the Far Eastern Institute of Geology in 1974. The main effort was concentrated in the Sikhote-Alin area for tin and polymetallic ores. Some 30 geological teams were assigned to Kamchatka, Sakhalin, Chukotca, the Kurills, and Khabarovsk Kray in a search for gold deposits. Geologists from the COMECON[10] countries were jointly prospecting for oil and gas in the Baltic Sea and in the Black Sea.

Despite the extensive, specially oriented geological prospecting conducted for many years, the production facilities at 34 enterprises of nonferrous industry, which were built recently, continued to experience ore shortages and losses due to miscalculations when estimating ore reserves.[11]

Capital investment in the Soviet economy amounted to 105.7 billion rubles in 1974, 7% over that of 1973. Production capacity either new, expanded, or renovated commissioned in the mineral industry during the year, in million tons, was as follows: Crude iron ore, 24.4; raw coal, 19.4; pig iron, 4.0; crude steel, 3.0; ferrous semimanufactures, 1.8; mineral fertilizers, 7.0 (Soviet standard); trunk crude and product lines, 6,200 kilometers; trunk gaslines, 8,400 kilometers; and powerplants, 10 million kilowatts. Construction plans which included projects for the above industries were not all met in 1974, and several important facilities due to startup in 1974 were not completed.

In 1974, 19.3% more capital investments were allocated for developing the refining and petrochemical industry compared with 1973 investments. Capital investment in the petroleum and gas industries increased 60% from 1965 to 1970 compared with the 1961–65 period, and 200% compared with the 1971–75 period.[12]

New enterprises that became operational in the iron and steel industry included facilities at the Mikhaylovskiy Novo-Krivorozhskiy, Ingyletskiy, and Lysakovskiy mining and processing combines, the No. 9 blast furnace at the Krivorozhsk works, the first stage of oxygen convertor shop No. 2 at the West Siberian works, blooming mill "1500" at the Nizhne-Tagilskiy complex, and rolling mill "950–900" at the Donetsk metallurgical works.

In nonferrous metallurgy new facilities

[7] Geologiya nefti i gaza (Geology of Oil and Gas), Moscow. No. 8, August 1974, p. 1.
[8] A. K. Karavayev. Technical Progress and Its Role in the Development of the Oil Industry on the U.S.S.R. Paper pres. at 9th World Energy Congress, Detroit Mich., 1974.
[9] Razvedka i okhrana nedr (Exploration and Conservation of Mineral Resources), Moscow. No. 5, May 1973, pp. 1–10; No. 3, March 1974, p. 2.
[10] COMECON (CMEA)—Council for Mutual Economic Assistance comprising the following countries: Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the U.S.S.R.
[11] Razvedka i okhrana nedr (Exploration and Conservation of Mineral Resources), Moscow. No. 1, January 1975, pp. 1–28.
[12] Neftyanoye khozyaystvo (Oil Economy), Moscow. No. 11, November 1974, p. 1.

were put into operation at the Krasnoyarsk aluminum plant and at the Dzhezkazganskiy, Norilskiy, and "Sveronikel" complexes.

New facilities for ammonium production were started up at the Novomoskovskiy and Severodonetskiy chemical complexes, at the Voskresenskiy and Gomelskiy chemical works, and at the Kuybyshevskiy nitrogen plant.

In the coal industry, the three following facilities were reported to have come onstream in 1974: The Krasnoarmeyskaya Kremenchugskiy, Polotskiy, Novo-Ufim-Donets Basin and two beneficiation mills—Zapadno-Donbasskaya No. 1 in Dneprovskaya Oblast' and Krasnaya Zvezda in Donets Oblast'.

New capacities for primary and secondary refining of crude oil started up at the Novokuybyshevskiy, Angarskiy, and Omskiy complexes, and at the Kirishskiy, Kremenchugskiy, Polotskiy, Novo-Ufimskiy, and Groznenskiy imeni Sheripova refineries. The first stage of the Orenburgskiy gas plant and of the 2,500-kilometer Tyumen'sk Oblast'-Tsentr trunk gas pipeline were completed in 1974.

The U.S.S.R. continued to experience much difficulty in the construction of mineral industry projects. Efforts were dispersed over a large number of projects, with the work taking 1.5 to 3 times as long as specified by the U.S.S.R. State Construction Committee. The 10- to 15-year period required to develop a mine with a capacity of 1 million to 2 million tons per year contributed to disparities between capacities of mines, concentration mills, and metallurgical plants, as for example, at the Petrovskhya-Glubokaya coal mine in the Donets Basin. During the development period (under development since 1962) estimated cost has risen by more than 20 million rubles as a result of the many changes in design. In 1973 alone, Dongiproshasht (Donets Coal Mining Design Institute) replaced 174 drawings related to the Petrovskhya-Glubokaya mine and 176 drawings for the Oktyabskiy Rudnik mine.[13] The 3-year construction time for the Karaganda metallurgical plant was approved by the Ministry of Ferrous Metallurgy. Actually, the plant has been under construction for 8 years and has not been completed. The cost of installing equipment increased from 16 million to 48 million rubles and later to 72 million rubles.[14]. Also in the field of ferrous metallurgy the following scheduled facilities were not put into operation in 1974: A blast furnace at the Karaganda metallurgical plant, an oxygen converter shop at the Novolipetsk plant, rolling mills at the Cherepovets and Nizhne-Serginsk metallurgical plants, and about 80 other projects. Construction of the following petroleum refineries was not proceeding according to plan: Groznyy, Kremenchug, Kherson, Krasnovodsk, Fergana, Mazheykyay, Chardzhov, Achinsk and Pavlodar.[15]

Construction of the 3,200-kilometer Baykal Amur Railway began in 1974. The present Trans-Siberian Railway runs parallel and very close to the People's Republic of China (PRC) border. This new line, even at its nearest point, is separated from the border by several hundred kilometers of rugged terrain. Annual capital investment in construction of Baykal-Amur Railway is expected to rise from 57 million rubles in 1974 to 285 million rubles in 1975; the completion date is currently set for 1982. The new railway will assist the economic development of a territory of some 1 million square kilometers which is reportedly rich in minerals.

Additional production capacities, including new or expanded plants and renovation of existing facilities in million tons unless otherwise specified, are shown below.

[13] Trud (Labor), Moscow. Aug. 15, 1974, p. 2.
[14] Kazakhstanskaya pravda, Alma-Ata. Dec. 18, 1974, p. 2.
[15] Stroitel'naya gazeta (Construction Gazette), Moscow. Mar. 27, 1974, p. 1.

| Commodity | Actual | | 1974 | |
|---|---|---|---|---|
| | 1972 | 1973 | Planned | Actual |
| Iron ore, crude | 28.5 | 39.0 | 36.7 | 24.4 |
| Coal and lignite, raw | 18.0 | 34.0 | 27.9 | 19.4 |
| Pig iron | -- | 3.7 | 5.8 | 4.0 |
| Steel, raw | 2.2 | -- | 7.0 | 3.0 |
| Finished ferrous rolled metal | 1.6 | 3.5 | 4.8 | 1.6 |
| Mineral fertilizers (Soviet standard) | 7.0 | 8.9 | 10.5 | 7.0 |
| Cement | 4.2 | 3.7 | 5.8 | 5.6 |
| Powerplant, million kilowatts | 1.5 | 11.0 | 11.3 | 10.0 |

Labor turnover remains a serious problem at many mines and plants. For example, in the three enterprises where surveys were conducted (the Turgay bauxite mining administration, the Irtyshskiy polymetallic complex, and the Zolotushinsk mining administration in Kazakhstan) labor turnover has reached 48.5%. During 1 year the worker turnover at the enterprises was almost one-half.[16] Soviet surveys showed that labor turnover has an adverse effect on the labor discipline among the workers. This is attributed mainly to the lag in housing construction and medical and consumer services, to low financial incentives, and to the heavy manual work involved.

Every year large-scale production facilities are put into operation in the mineral industry, while facilities for housing and consumer services are lagging. For example almost 14,000 workers at the Cherepovets metallurgical plant are waiting for housing.[17]

Soviet statistical agencies do not publish data on the actual earnings of mineral industry workers. The average monthly earnings of all Soviet workers and employees in 1974 was 140.7 rubles[18] compared with 134.9 rubles in 1973, an increase of 4.3%. According to the Economic Gazette,[19] the average earnings of white collar employees in the Soviet coal industry were 177 rubles per month in 1973. In 1974 the monthly minimum wage continued to rise and went from 60 to 70 rubles in the North and the Soviet Far East regions.[20]

When considering the actual market value of 1 ruble to be US$0.33 (on the Soviet black market the rate of $1.00 equals between 3 and 4 rubles), then the average real annual earnings of Soviet workers and employees, white collar workers in the coal industry, and minimum wage workers amount to $540, $708, and $280, respectively.

The U.S.S.R.'s reported mineral commodity consumption per capita approaches that of Western Europe, although there is still a significant difference in the standard of living. One reason for the apparent difference is that the Soviet growth is measured in terms of energy and minerals produced not in terms of energy and metals usefully consumed. In addition, fuel and mineral shortages often bring with them substandard commodities which are marketed as standard items.

Although simple comparisons of minerals data between the Soviet Union and those of Western countries are often made, most are invalid unless qualified in great detail. Thus, the relative size or the relative growth of the economy of the Soviet mineral industry can best be determined from a careful and exhaustive study of all pertinent Soviet publications. Soviet self-criticism, although sometimes reported in obscure fashion, shows an amazing and acute awareness of the problems of the Soviet industries.

Practically all mineral commodity exports increased in 1974, with fuel exports showing the fastest growth. Fuels, mineral raw materials, and metals play the largest role in Soviet exports, representing about 44% of total official exports during 1974. Oil, gas, and metal exports are expected to rise, despite increasing domestic demand and some production and transportation difficulties. The export of mineral commodities produces foreign exchange to help pay for imports, even though almost all mineral commodities exported could be easily consumed within the country.

**Government Policies and Programs.**—Soviet mineral policy continues to be based on the principle of maximum self-sufficiency at any price. Actual or estimated costs of production in the U.S.S.R. are not a prime factor in the selling price of a commodity on the domestic or international market. The Soviet system permits the establishment of selling prices at any level believed desirable to meet political and economic requirements. Therefore, many mineral ventures in the Soviet Union would be uneconomic by Western standards.

One of the most striking contrasts between Soviet and Western mineral economies is the clear direction given to the development of Soviet mineral policy. In

[16] Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 1, January 1974, pp. 67–71. Soviet yustitsiya (Soviet Justice), Moscow. No. 18, September 1974, pp. 18–20.

[17] Sovetskaya Rossiya (Soviet Russia), Moscow. Sept. 19, 1974, p. 2.

[18] Official exchange rate is 1 ruble=US$1.37 (Jan. 1, 1975). Approximate buying power of 1 ruble relative to prices in the United States for hard goods and food according to some estimates ranges from about 20 to 50 cents.

[19] Ekonomicheskaya gazeta (Economic Gazette), Moscow. February 1974.

[20] Pravda, Moscow. Jan. 25, 1975, p. 3.

most market-oriented economies, national mineral policy is largely an accommodation of often divergent and conflicting sectors in the economy. In contrast, the Soviet Union's 5-year plans and the year-to-year plans set, in unmistakable terms, a definite policy for all mineral commodities. In addition to expressing established national priorities within which each industry must operate while at the same time pursuing the goals set for it, the plan is also law and carries mandatory obligations. Mineral development, as the basis for industrial growth, holds a key place in Soviet economic policy. Substantial funds are spent on mineral exploration and development and the funds are distributed over a dozen specialized ministries.

Much attention is now being devoted to economic integration of the COMECON countries, which makes East Europe, Mongolia, and Cuba more dependent upon the Soviet mineral industry. Yugoslavia is not a member of COMECON, although an agreement formalized in 1964 laid the foundation for Yugoslav cooperation and participation within the group (it has observer status in half of the COMECON's 24 commissions). An agreement on cooperation between Yugoslavia and COMECON's International Investment Bank was signed on April 26, 1974. Yugoslavia is the first country which is not a COMECON member to sign a cooperation agreement with the Bank. The COMECON also cooperates with Finland under a 1973 agreement.

The Soviet Union and its COMECON partners have agreed on a plan for economic integration over the next 15 to 20 years, and the COMECON countries in East Europe are participating with their capital, machinery, and labor in the development of the Soviet minerals industry. Among the new forms of cooperation between COMECON countries are long-term and large-scale "joint" ventures in industrial construction, particularly in the development of Soviet natural resources. The East European countries are now engaged in the construction of the Staryy Oskol Steel complex, the Kiembay asbestos plant, the "Mir" electric system, the "Druzhba" oil pipeline, and many other Soviet projects. In the first half of 1974, the U.S.S.R. required these countries to make new contributions to the Orenburg gas project and to the construction of a 2,750-kilometer gas pipeline from Orenburg to the Soviet-Western border. The control of the COMECON countries is arranged by the Soviet Union through the International Bank for Economic Cooperation and the International Investment Bank.

In certain circumstances, the Soviet Union extends credits for the construction of certain industrial projects under "aid" for the industrialization of COMECON nations, where rich resources of ores and fuels exist. However, the production goes to the Soviet Union to offset credits and interest and to pay for the services, fuels, and metals that are imported from the U.S.S.R. In this way, the uranium resources of Czechoslovakia and Hungary, the bauxite of Hungary, the nickel of Cuba, the polymetallic ores and concentrates of Bulgaria, and the coal, copper, and zinc of Poland go directly to the Soviet Union.

Soviet law does not permit private ownership of the "means of production", but foreign investors are invited to develop deposits and to construct plants in the U.S.S.R. and repayment is promised in the form of production from these operations. Thus the Soviet Union was able to bring much needed investment and technology from Western countries by using joint venture arrangements.

In its economic relations with developed Western countries, the Soviet Union strives for all-round businesslike cooperation. Longterm agreements on developing economic, scientific, technical, and industrial cooperation with the United States, West Germany, France, Italy, the United Kingdom, and others were signed in 1974. These provide for cooperation in the construction of industrial complexes, expansion and modernization of existing industrial enterprises, and research planning. They also provide for the implementation of "joint" operations in such fields as computer technology, instrument building, chemical industries, ferrous and nonferrous metallurgy, the oil, coal, and mineral industries, and protection of the environment. The Soviet Union needs Western technology to solve many problems of the mineral industry.

The Soviet Union has large technical assistance and economic aid programs including over 300 projects in 64 foreign countries at a total cost of about 5 billion rubles. Soviet specialists provide technical

assistance for geological research, prospecting, and exploration in 30 developing countries.[21] This work is conducted through bilateral agreements and through appropriate agencies of the United Nations.

In many instances, developing countries pay for Soviet assistance with mineral commodities. The U.S.S.R. is now able to secure a substantial flow of mineral imports at low cost from friendly, developing countries, and there are indications that it intends to extend this pattern to gain exclusive access, for itself and other COMECON countries, to deposits of exceptional quality.

In September 1974 the Soviet Government, in accordance with the March 2, 1973 decree of the Council of Ministers and Central Committee of the CPSU on measures for further perfecting industrial management, approved management restructuring in the coal, oil, and gas industries.

The coal industry will be managed on both the two-link (National Ministry and Producing Association) and the three-link system (National Ministry, Ukranian Ministry, and Producing Association). The gas industry will also have a two- and three-link system, depending on the specific character of gas development in individual regions of the country: The U.S.S.R. Ministry of Gas Industry-Production Association/Enterprise; and the U.S.S.R. Ministry of Gas Industry-All Union Industrial Association-Production Association/Enterprise. The oil industry will operate exclusively on the two-link system: U.S.S.R. Ministry of Oil Industry-Production Association/Enterprise.

Coal, gas, and oil industries will have 47, 32, and 22 production associations, respectively, to be achieved through combining 1,600 coal, 200 gas, and 300 oil independent enterprises and organizations.

As envisaged in the 1973 decree, formation of industrial and production associations will be accompanied by elimination of the main production administrations (glavki) of central coal, gas, and oil in Moscow. Target dates for final changes in these ministries to the new management system are 1974 (gas industry), 1975 (oil industry), and 1976 (coal industry). The new system of management will result in annual savings to the Government of 120 million to 130 million rubles in the coal industry, 100 million to 110 million rubles in the gas industry, and 27 million rubles in the oil industry.[22] Numbers of white collar workers in management of three industries were also significantly reduced.

In 1974, the draft of the general scheme for management of ferrous metallurgy was being worked out jointly with the Gosplan (State Planning Committee of the U.S.S.R.) and the Ministry of Finance, after which it would be submitted to the U.S.S.R. Council of Ministers.

The State plan for 1975 was approved by the CPSU Central Committee and ratified by the Supreme Soviet on December 20, 1974. Soviet planners reduced the 1975 target provided for in the original 5-year plan and stressed heavy industry production for the year. The plan calls for an overall increase in industrial output of 6.7% including a 7% increase in heavy industry output and a 6% increase in consumer goods output. Capital investments in 1975 will total 113 billion rubles, or a 7.3% increase over those of 1974. Major investment areas in 1975 will be the fuel-energy sector, ferrous and nonferrous metallurgy, the chemical industry, and the machine construction industry.

Special attention in the 1975 plan is focused on the fuel and power sectors. The production of electric power is to increase by 60 billion to 1,035 billion kilowatt-hours. Because of the constant fuel crisis and to improve the fuel-energy balance in the European part of the U.S.S.R., impetus will be given in 1975 to rapid expansion of nuclear powerplants. Crude oil extraction (including condensate) is planned at 489.4 million tons, 30 million tons over that of 1974; natural gas output is to amount to 285 billion cubic meters, an increase of more than 24 billion cubic meters over that of 1974. The main sources to increase petroleum and gas production in 1975 are the fields of Western Siberia, Kazakhstan, Central Asia, the Komi A.S.S.R., the Udmurt A.S.S.R., and Permskaya, and Orenburgskaya Oblasts.

Raw coal and lignite output is to total 700 million tons. The coal and lignite production target for 1975 will be above the original 5-year plan, which highlights the importance attached to coal and lignite as substitutes for oil and gas. It is planned to invest 2.5 billion rubles in development of the coal and lignite industry in 1975; the main annual increase in

[21] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Sept. 14, 1974, p. 4.
[22] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Sept. 6, 1974, p. 1.

production of hard coal is to be in the Donets Basin (5.5 million tons) and in the Kuznetsk Basin in Siberia (4.3 million tons).

Crude steel output is to be increased 6 million to 142 million tons. Compared with 1974 production, finished ferrous rolled metal is to be increased by about 5% and steel pipes by 6.2%. The rolled steel industry faces problems of both quantitative as well as qualitative production. Capital investment in ferrous metallurgy is to be increased by more than 19% over that of 1974.

The 1975 nonferrous metallurgy plan calls for increased production of aluminum, copper, nickel, and other metals. Objectives are being specified to develop the ore base for the nonferrous sector and particularly for the lead, zinc, and copper industries. The 1975 plan envisages production of 90 million tons (Soviet standard) of mineral fertilizers, an increase of 10.3 million tons, and the production of 122 million tons of cement, an increase of 7.0 million tons. The power potential of the U.S.S.R. is to be increased by 13 million kilowatts in 1975.

A 28-million-ton increase in crude iron ore capacity is to be obtained by the construction of new facilities at the Lebedinskiy, Novokrivorozhskiy, Kachkanarskiy, and Dneprovskiy iron ore mining and concentrating complexes. New facilities for finished ferrous rolled metal are to be put into operation at the West Siberian, Cherepovetz, and Orsk-Khalilovo metallurgical plants. The plan also calls for construction of 10,000 kilometers of main oil and gas pipelines.

Soviet industrial production, in million tons unless otherwise specified, is shown in the following tabulation:

| Commodity | 1974 | | 1975 | |
|---|---|---|---|---|
| | Planned | Actual | Originally planned | Newly planned |
| Iron ore (usable) | 221.0 | 225.0 | 254.0 | 235.5 |
| Pig iron | 99.5 | 99.0 | 105–110 | 104.8 |
| Steel, raw | 135.9 | 136.2 | 142–150 | 142.0 |
| Finished ferrous rolled metal | 95.2 | 95.9 | 101–105 | 99.5 |
| Steel pipes | 15.1 | 15.0 | e 18.0 | 15.9 |
| Cement | 114.0 | 115.0 | 122–127 | 122.0 |
| Mineral fertilizers (Soviet standard) | 80.2 | 80.3 | 90.0 | 90.0 |
| Coal, raw (bituminous, anthracite, lignite) | 679.1 | 678.6 | 685–695 | 700.0 |
| Natural gas billion cubic meters | 256.8 | 261.0 | 300–320 | 285.0 |
| Petroleum, crude including condensate | 458.9 | 459.0 | 480–500 | 489.4 |
| Power, electric billion kilowatt-hours | 975.0 | 975.0 | 1030–1070 | 1,035.0 |

e Estimate.

The 1975 plan, and all preceding plans, call for complete utilization of capacities, primarily in the field of fuel extraction, ferrous and nonferrous metallurgy, and the chemical industry. Efficiency of the utilization of working capital is also to be improved. The Soviets plan to save around 1.5 million tons of rolled ferrous metals in machine-building and metal processing, more than 11 billion kilowatt-hours of electric power, and about 12 million tons of standard fuel equivalent and other material resources. In 1975 average monthly earnings of Soviet workers are planned to be over 144 rubles, or 2.7% over those of 1974. Increases of minimum wages for industrial workers to 70 rubles per month will continue in 1975.

The 10th 5-year plan (1976-80) envisages large projects in a number of sectors including fuel-energy, agriculture, and railways and several major industrial projects in cooperation with other COMECON nations.

Policy in the fuel sector will be characterised by structural changes that will enhance the coal industry as compared with the oil and natural gas industries which resulted from a new technology that promised to produce gaseous and liquid fuels from coal. Experimental work is to be greatly expanded in order to create a new branch of the fuel industry. At the same time, both the oil and gas industries will be developed further. Geological exploration will be concentrated on the growth in recoverable reserves in the European part of the U.S.S.R. and efforts will be made to increase recovery of oil and gas.

Declining reserves of raw materials and fuels in the European part of the U.S.S.R. have forced Soviet planners to give increased attention to reserves located in the north and east of the country. Exploiting these reserves will be difficult because of extreme climatic conditions and will also necessitate large capital investment in railroads and pipelines for long-distance transportation.

Efficient use of capital investment and improved labor productivity both have high priorities under the 10th 5-year plan. The plan also calls for changes in economic indicators. There will be three new sections: (1) Environmental protection and improved utilization of natural resources; (2) economic cooperation between the U.S.S.R. and the Socialist countries and the development of economic integration (formerly this was in the foreign trade section); and (3) improving economic management. In the new plan more emphasis will be paid to indicators which characterise scientific-technical progress. Beginning in 1976, planning and accounting of industrial commodity output and other value indicators will be calculated using prices and rates of January 1, 1975, instead of those of July 1, 1967.[23]

## PRODUCTION

A Soviet decree dated April 28, 1956, classifies as State secrets all data on production capacity and production plans of nonferrous, precious, and rare metals enterprises as well as data on the fulfillment of these plans.

Although the U.S.S.R. does not publish official statistics on many mineral commodities, information on most basic materials is available. Together with published information on industrial development, this information provides the basis for estimating output of other commodities. Many of the figures in the production table are interpretative extrapolations from Soviet published material and represent at best an order of magnitude.

Production of nonferrous metals using oxygen, natural gas and electrothermic processes increased in 1974. At the Balkhash complex in Kazakhstan, for example, about 20% of all copper concentrate was smelted directly in the converters, bypassing the reverberatory smelting stage. The Almalyk complex in Uzbekistan is using an oxygen-flash smelting process. More than 70% of the nonferrous enterprises were using natural gas in 1974. The natural gas consumption of the nonferrous industry reached 5 billion cubic meters in 1974.

Recovery of metals in concentrate increased during 1966–70 as follows: Copper, 2.5%; zinc, 3.2%; nickel, 7.2%; tungsten, 2.5%; and molybedenum, 4.6%. In metallurgical conversion the extraction of nickel increased 2.7%; zinc, 1.9%; cobalt, 1.3%; and copper, 0.5%. During the current 5-year plan there has been a further increase in extraction from ores and concentrates, but the planned extraction targets for many nonferrous metals were not achieved and continued to be much below the Western level.

In the course of mining and processing at the Bashkirian copper-sulfur complex, the Uchaly mining and concentration combine, and the Buribayevskiy ore administration in Bashkir A.S.S.R. significant quantities of zinc, sulfur, and precious metals were lost. Similarly, the third section of the Uchaly' concentrator was recently put into operation with imperfections and zinc concentrate was not recovered for some time. Planned quotas for extracting copper and zinc were also not met at the Sibay, Tekeliyskaya, Berezovskaya, Leninogorskaya, Belousovskaya, and other concentrators, resulting in losses of nonferrous and rare metals.[24]

There are also important slag losses. In June 1974 there were more than 280 million tons of slag containing about 8 million tons of metal in dumps at 17 large metallurgical plants alone. Although 2.5 million tons of metal was recovered from slag in 1965, this has declined to 1.3 million tons in 1973 despite increasing slag quantities. Technically the extraction of metal from slag is extremely poor at metallurgical plants, and magnetic separation is only done at certain enterprises.[25]

In 1974, a number of mines and plants were commissioned despite numerous imperfections and inadequate equipment.

[23] Vestnik statistiki (Herald of Statistics), Moscow. No. 10, October 1974, p. 77.
[24] Izvestiya, Moscow. Feb. 19, 1974, p. 3. Tsvetnye metally (Nonferrous Metals), Moscow. No. 9, September 1974, pp. 70–74.
[25] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Sept. 19, 1974, p. 2.

Many projects have operated over a long period with lower capacities than originally planned. Only 75% of new projects manage to reach rated capacity because of poor design quality and defects in equipment. By January 1, 1974, planned capacity had not been reached at many blast furnaces, open-hearth shops, and rolling mills.[26] In the coal industry 190 mines did not reach their planned capacity in 1974.[27]

In many sectors of the Soviet economy more electric power, fuels, and metals are consumed per unit of product than is required with modern technology. In many Soviet industrial enterprises an enormous quantity of secondary power, fuels, and metals are insufficiently utilized.

Because of a shortage of some needed equipment, there was a rapid increase in stocks at many establishments. Stocks at Soviet industrial enterprises increased 990 million rubles during 9 months of 1973, which included 138 million rubles of foreign equipment. At the same time many other projects could not be completed because of a shortage of equipment.[28]

Ferrous metal production in the U.S.S.R. is increasing from year to year and rolled steel output reached 109 million tons in 1974. Nevertheless, the economy continued to experience shortages of ferrous metals. The June 1974 decree of the Central Committee of the CPSU pointed out that the Ministry of Ferrous Metallurgy U.S.S.R. was not taking the necessary steps to improve quality and broaden the variety of rolled products, pipe, and other metal products. Production fell considerably short of goals for rolled products made of low-alloy steels, for example, principally because of the lack of thermal facilities in metallurgical plants.[29] A study of Soviet publications showed that only about 45% of the total crude steel production is effectively used in the Soviet economy, and more than one-half is remelted or lost as a result of inefficient production and consumption of metal.

The quality of raw materials at some blast furnaces has deteriorated and the productivity of furnaces has sharply declined, while at other locations breakdowns have become more frequent and idle time for equipment has risen.[30]

The total cost of production installations and equipment in the coal industry increased from 7,154.4 million rubles in 1960 to 12,714.4 million rubles in 1972, or 80%, but production of coal and lignite increased only 23% during the same period. The efficiency of capital investment in the coal industry decreased 28% during the 1960–72 period.[31]

Over 90% of 1974 mineral production was shipped by rail. The average transportation distances follow: Coal and lignite, 687 kilometers; coke, 792 kilometers; crude oil and petroleum products, 1,252 kilometers; iron and manganese ores, 731 kilometers; and ores for the nonferrous industry, 931 kilometers.

While the U.S.S.R. does not publish statistical data of injuries in the mineral industry, available Soviet information reveals that there were many fatal injuries in the mineral industry. In 1974, fatal injuries occurred at 485 Soviet coal mines,[32] and there were serious problems in the coal industry. There was a high rate of fatal injuries in many mines which resulted from mine management neglect, inadequate safety conditions, and violations of safety regulations and labor laws in order to increase production. Fatal injuries in the nonferrous industry of Kazakhstan did not decrease.[33] The accumulation of dust at work sites in the underground coal and metal mines of the Soviet Union is high and often exceeds the sanitary standard.[34]

The administration of Soviet mines and plants, with the approval of the trade organization, has often used overtime work to fulfill the planned production quotas, has sometimes required workers to work two or three shifts in succession, and has required underground miners to work an

[26] Metallurg (Metallurgy), Moscow. No. 11, November 1974, pp. 1–4.
[27] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 6, February 1975, p. 2.
[28] Material'no-teknicheskoye snabzheniye (Material-Technical Supply), Moscow. No. 9, September 1974, pp. 42–49.
[29] Material'no-tekhnicheskoye snabzheniye (Material-Technical Supply), Moscow. No. 3, March 1974, p. 48.
Pravda, Moscow. June 21, 1974.
Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 4, January 1975, p. 2.
[30] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Aug. 27, 1974, p. 1.
[31] Ugol' (Coal), Moscow. No. 11, November 1974, pp. 48–52.
[32] Bezopasnost' truda v promyshlennosti (Labor Safety in Industry), Moscow. No. 1, January 1975, pp. 3–5.
[33] Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 1, January 1974, pp. 67–71.
[34] Sovetskiy shakhter (Soviet Miner), Moscow. No. 7, July 1973.
Promyshlennost' Armenii (Industry of Armenia), Yerevan. No. 7, July 1973.

8-hour shift instead of a 6-hour shift, in violation of labor law.[35]

The general level of technology in the Soviet mineral industry has lagged consistently behind that of the more advanced Western countries. The rule is that new technology is introduced and proved first in the Western country and then after a time it is made available to the U.S.S.R. Transfer of Western technology to the Soviet Union continued to be the most important factor in Soviet mineral industry development. A low degree of mechanization is characteristic in such areas as mine development, roof support, and hauling of coal and ores. The labor intensive functions of mining and metallurgy occupy large numbers of workers who could be replaced by machinery. For example, in coal mining, manual labor is used almost exclusively in longwall work (49,000), for roof support in development workings (24,000), for loading of coal and rock in development workings (20,000), and for maintenance of workings (76,000 workers).[36] Many operations in loading and maintenance shops of nonferrous enterprises were performed manually, with the result that hundreds of million rubles were lost.[37]

The Soviets are increasingly conscious of the age and obsolescence of their machine tools and of much of their mining and metallurgical machines and equipment. Soviet industries continue to turn out obsolete models because the emphasis is on production and no time adjustments are made for retooling. The Soviets prefer not to use new and untried equipment with its inherent risk of failure and are inclined to use old and established equipment.

Soviet reports have documented obsolete equipment in 43 blast furnaces, 80 open-hearth furnaces, 97 rolling mills, about half of the power units, and a large percentage of the metal products equipment. Ten-year-old units are being used to smelt 31% of the pig iron, 29% of the open-hearth steel, and 31% of the finished rolled metal.[38] Out of 200 coking batteries in the U.S.S.R., more than half have been operating for more than 20 years, some of them for 40 years. Many became obsolete or were worn out long ago.[39]

The use of obsolete drills and the inferior quality of drilling bits and steel in underground metal mining required a large number of manual workers.[40] The petroleum and gas industries also had special problems. The drilling of exploration and developmental wells in these industries failed to meet planned targets.[41]

Automation of Soviet rolling mills lags behind that of the Western countries both in availability of the facilities and the systems necessary for automation of rolling equipment.[42]

Soviet investigations show that coal production equipment is utilized at an average rate of 40% to 45% while the plan calls for 65%. This means that between 55% and 60% of the machinery and equipment is idle. As a result the coal industry is losing more than 180 million rubles per year. The situation is made worse by the fact that generally coal enterprises are not responsible for the low level of equipment utilization, and they are not much interested in improving the situation.[43].

Half of the quotas set for longwall machinery have not been fulfilled. As a result, almost one-quarter of the Ukranian coal mines failed to meet their planned targets for the first half of 1974,[44] and some 70% of the coal at the steeply inclined coal seams in the Donets Basin is mined by means of obsolete pneumatic pick.[45]

During the last 3 years, labor productivity at the Chukotka gold and tin mines declined 1.8% and production cost of the metals increased significantly. Excavators, bulldozers, drilling machines, trucks, and other machines, which were made for the use in the central regions of the European part of the U.S.S.R., were idle for a long time under Arctic conditions.[46]

In the cement industry, for each rotary furnace, there are an average of 50 short

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[35] Literaturnaya gazeta (Literary Gazette), Moscow. July 25, 1973.
Stroitel'naya gazeta (Construction Gazette), Moscow. Oct. 6, 1974, p. 2.
[36] Ugol' (Coal), Moscow. No. 8, August 1972.
[37] Finansy U.S.S.R., Moscow. No. 8, August 1974, pp. 29–34.
[38] Ekonomika i organizatsiya promyshelennogo proizvodstva (Economic and Organization of Industrial Production), Novosibirsk. No. 4, April 1974, pp. 70–84.
[39] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Oct. 19, 1974, p. 2.
[40] Work cited in footnote 39.
[41] Pravda Ukrainy, Kiev. Sept. 12, 1974, p. 1.
[42] Ekonomika Sovetskoy Ukrainy (Economics of the Soviet Ukraine), Kiev. No. 7, July 1974, pp. 53–58.
[43] Sotsialisticheskaya industriya (Socialist Industry), Moscow. June 30, 1974, p. 2.
[44] Work cited in footnote 41.
[45] Trud (Labor), Moscow. Oct. 30, 1974, p. 1.
[46] Sotsialisticheskaya industriya (Socialist Industry), Moscow. July 19, 1974, p. 2.

or more extensive periods of idle time each year, resulting in total losses of 18,000 to 20,000 hours per year.[47]

[47] Tsement (Cement), Moscow. No. 8, August 1974, p. 9.

Table 1.—U.S.S.R.: Estimated [1] production of mineral commodities
(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Ores and concentrates: | | | |
| Bauxite, 26% to 52% alumina | 4,200 | 4,300 | 4,300 |
| Nepheline concentrate, 25% to 30% alumina | 1,700 | 2,150 | 2,150 |
| Alunite ore, 16% to 18% alumina | 500 | 600 | 600 |
| Alumina | 2,300 | 2,400 | 2,400 |
| Metal, smelter: | | | |
| Primary | 1,250 | 1,360 | 1,430 |
| Secondary | 120 | 125 | 130 |
| Antimony, mine output, metal content ——— metric tons | r 7,200 | 7,250 | 7,300 |
| Arsenic, white ($As_2O_3$) ——— do | 7,200 | 7,250 | 7,300 |
| Beryllium, beryl, cobbed, 10% to 12% BeO ——— do | 1,350 | 1,450 | 1,500 |
| Bismuth, mine output, metal content ——— do | 55 | 55 | 60 |
| Cadmium, smelter ——— do | 2,450 | 2,500 | 2,600 |
| Chromium, chromite ore, 30% to 56% $Cr_2O_3$ | 1,850 | 1,900 | 1,950 |
| Cobalt: | | | |
| Mine output, metal content ——— metric tons | 1,650 | 1,700 | 1,750 |
| Smelter ——— do | 1,650 | 1,700 | 1,750 |
| Copper: | | | |
| Ore: | | | |
| Gross weight, 0.5% to 2% Cu | 66,500 | 70,000 | 74,000 |
| Metal content, recoverable | 665 | 700 | 740 |
| Blister: | | | |
| Primary | 665 | 700 | 740 |
| Secondary | 150 | 150 | 160 |
| Refined: | | | |
| Primary | 630 | 665 | 705 |
| Secondary | 140 | 150 | 160 |
| Gold, mine output, metal content ——— thousand troy ounces | 6,900 | 7,100 | 7,300 |
| Iron and steel: | | | |
| Iron ore 55% to 63% Fe | [2] 208,127 | [2] 216,104 | [3] 224,883 |
| Agglomerated products: | | | |
| Sinter | 143,000 | [3] 146,123 | [3] 148,796 |
| Pellets | 17,500 | [3] 21,545 | [3] 23,417 |
| Pig iron and ferroalloys: [3] | | | |
| Pig iron for steelmaking | [4] 82,374 | 86,225 | 90,167 |
| Foundry pig iron | [4] 8,956 | 8,712 | 8,709 |
| Spiegeleisen | [4] 102 | 83 | 107 |
| Ferromanganese | [4] 869 | 888 | 859 |
| Other blast furnace ferroalloys | [4] 26 | 26 | 25 |
| Total | 92,327 | 95,933 | 99,868 |
| Crude steel: [3] | | | |
| Ingots | [4] 117,438 | 123,182 | 127,248 |
| Steel for casting | [4] 8,151 | 8,299 | 8,958 |
| Total | 125,589 | 131,481 | 136,206 |
| Semimanufactures: [3] | | | |
| Sections | 34,113 | 35,937 | 36,814 |
| Wire rods | 7,625 | 7,990 | 8,073 |
| Pipe stock | 5,027 | 5,290 | 5,394 |
| Tubes from ingots | 1,608 | 1,657 | 1,652 |
| Plates and sheets: | | | |
| Over 5 millimeters thick | 11,335 | 11,592 | 12,295 |
| Other | 15,475 | 16,352 | 16,714 |
| Total plates and sheets | 26,810 | 27,944 | 29,009 |
| Strip | 8,373 | 8,919 | 9,337 |
| Railway track material | 3,769 | 3,688 | 3,703 |
| Wheels, tires, and axles | 927 | 946 | 1,059 |
| Unspecified shapes for sale | [5] 674 | 682 | 779 |
| Other and unspecified | 86 | 65 | 65 |
| Total semimanufactures | [6] 89,012 | 93,118 | [6] 94,295 |

See footnotes at end of table.

## Table 1.—U.S.S.R.: Estimated [1] production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and Steel—Continued | | | |
| Selected end products: [3 6] | | | |
| Welded pipes and tubes | 7,893 | 8,313 | 8,735 |
| Seamless pipes and tubes | 5,936 | 6,058 | 6,224 |
| Total pipes and tubes | 13,829 | 14,371 | 14,959 |
| Cold rolled sheet | [5] 5,502 | 5,813 | 6,492 |
| Tinplate | [5] 518 | 561 | 613 |
| Galvanized sheet | [5] 554 | 612 | 638 |
| Electrical sheet | 1,001 | 1,007 | 1,111 |
| Cold reduced strip | 252 | 320 | 352 |
| Wire, plain | [5] 3,420 | 3,473 | 3,724 |
| Lead: | | | |
| Mine output, recoverable metal content | 460 | 470 | 475 |
| Smelter: | | | |
| Primary | 460 | 470 | 475 |
| Secondary | 90 | 90 | 95 |
| Magnesium metal, including secondary | 54 | 57 | 60 |
| Manganese ore, gross weight [2] | 7,819 | 8,245 | 8,300 |
| Mercury metal, including secondary, 76-pound flasks | 50,000 | 52,000 | 54,000 |
| Molybdenum, mine output, metal content, metric tons | 8,200 | 8,500 | 8,800 |
| Nickel: | | | |
| Mine output, metal content | r 105 | 115 | 125 |
| Smelter | 125 | 135 | 145 |
| Platinum, mine output, metal content, thousand troy ounces | 2,350 | 2,450 | 2,500 |
| Silver metal, including secondary, do. | 40,000 | 41,000 | 42,000 |
| Tin: | | | |
| Mine output, recoverable metal content, long tons | 28,500 | 29,000 | 29,500 |
| Smelter: | | | |
| Primary, do. | 28,500 | 29,000 | 29,500 |
| Secondary, do. | 10,000 | 10,000 | 10,000 |
| Titanium metal, metric tons | r 24,000 | r 27,000 | 28,000 |
| Tungsten concentrates, contained tungsten, do. | 7,200 | 7,400 | 7,600 |
| Vanadium content of exported slag [7], do. | 3,375 | 3,850 | e 3,900 |
| Zinc: | | | |
| Mine output, recoverable metal content | 650 | 670 | 680 |
| Metal: | | | |
| Primary | 650 | 670 | 680 |
| Secondary | 70 | 70 | 75 |
| NONMETALS | | | |
| Asbestos | 1,220 | 1,280 | 1,360 |
| Barite | 310 | 320 | 330 |
| Boron minerals and compounds, $B_2O_3$ content | 75 | 75 | 80 |
| Cement, hydraulic [2] | 104,299 | 109,500 | 115,145 |
| Clays: Kaolin (including china clay) | 2,000 | 2,100 | 2,100 |
| Corundum, natural, metric tons | 7,000 | 7,000 | 7,000 |
| Diamond: | | | |
| Gem, thousand carats | 1,850 | 1,900 | 1,900 |
| Industrial, do. | 7,350 | 7,600 | 7,600 |
| Total, do. | 9,200 | 9,500 | 9,500 |
| Diatomite | 380 | 390 | 400 |
| Feldspar | 260 | 270 | 275 |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogen compounds, N content | [2] 6,551 | 7,245 | 7,856 |
| Phosphatic: | | | |
| Apatite: | | | |
| Ore, 17.7% $P_2O_5$ | 28,300 | 31,300 | 35,600 |
| Concentrate, 39.4% $P_2O_5$ | 12,000 | 13,000 | 15,300 |
| Sedimentary rock: | | | |
| Ore, 13% $P_2O_5$ | 21,000 | 21,500 | 22,000 |
| Concentrate, 19% to 25% $P_2O_5$ | 10,500 | 10,750 | 11,000 |
| Potassic, potash, $K_2O$ equivalent | [2] 5,433 | 5,918 | 6,586 |
| Manufactured: | | | |
| Nitrogenous, gross weight | [2] 31,945 | 35,310 | 38,308 |
| Phosphatic: | | | |
| Meal, gross weight | [2] 5,319 | 5,395 | 5,442 |
| Other, gross weight | [2] 15,663 | 17,305 | 20,863 |
| Potassic, gross weight | [2] 13,061 | 14,224 | 15,832 |
| Other and unspecified, gross weight | r 78 | 100 | NA |
| Total [2] | 66,066 | 72,332 | 80,357 |
| Fluorspar | 430 | 440 | 450 |
| Graphite | 80 | 85 | 90 |

See footnotes at end of table.

Table 1.—U.S.S.R.: Estimated[1] production of mineral commodities—Continued
(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Gypsum | 4,700 | 4,700 | 4,700 |
| Lime, dead burned | 22,000 | 22,000 | 22,000 |
| Magnesite: | | | |
| Crude | 3,300 | 3,400 | 3,500 |
| Marketable product | 1,650 | 1,710 | 1,730 |
| Mica | 39 | 40 | 41 |
| Pyrite: | | | |
| Gross weight | 7,200 | 7,300 | 7,500 |
| Sulfur content | 3,400 | 3,500 | 3,600 |
| Refractory materials: | | | |
| Dinas (quartzite-lime) | [2]618 | 621 | 632 |
| Magnesite and chrome magnesite | [2]1,444 | 1,500 | 1,718 |
| Magnesite powder | [2]1,298 | 1,350 | 1,385 |
| Shamotte | [2]6,102 | 6,200 | 6,425 |
| Total | [2]9,462 | 9,650 | 10,160 |
| Salt, all types | [2]12,200 | 12,900 | 13,400 |
| Sulfur, elemental (excluding sulfur content of pyrite): | | | |
| From ores | 2,200 | 2,300 | 2,400 |
| Byproduct recovered | 1,700 | 1,850 | 2,000 |
| Talc | 390 | 400 | 410 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal: [8] | | | |
| Anthracite | [2]75,417 | [2]76,433 | 75,828 |
| Bituminous: | | | |
| Coking | [2]169,991 | [2]173,445 | 175,535 |
| Other (not specifically identified) | [2]254,061 | [2]260,743 | 272,504 |
| Total "hard" coal | [2]499,469 | [2]510,621 | 523,867 |
| Lignite and brown | [2]155,719 | [2]156,960 | 160,641 |
| Coke, oven, beehive, breeze and gas coke [9] | 79,773 | 81,401 | 82,641 |
| Fuel briquets: | | | |
| From anthracite and bituminous coal [9] | 1,488 | 1,474 | e 1,500 |
| From lignite and brown coal [9] | 6,533 | 6,673 | e 6,808 |
| Total | 8,021 | 8,147 | 8,308 |
| Gas, natural: | | | |
| Gross production million cubic feet | 8,200 | 8,800 | 9,700 |
| Marketed production [2] do | 7,818 | 8,334 | 9,217 |
| Peat: | | | |
| Agricultural use | r 130,400 | 133,100 | 131,600 |
| Fuel use | [2]61,200 | [2]58,500 | 60,000 |
| Oil shale | [2]29,258 | 31,123 | 33,266 |
| Petroleum: | | | |
| Crude: | | | |
| As reported, gravimetric units [2] | 400,440 | 429,037 | 458,948 |
| Converted, volumetric units thousand 42-gallon barrels | 2,943,234 | 3,094,350 | 3,373,650 |
| Refinery products [10] thousand tons | 292,000 | 316,000 | 326,000 |

[p] Preliminary. [r] Revised. NA Not available.
[1] Estimate except where otherwise noted.
[2] Reported in Soviet sources.
[3] Source: Unless otherwise specified, United Nations Annual Bulletin of Steel Statistics for Europe, 1974, v. 2, New York, 1975, p. 23.
[4] Estimated from reported total given subsequently in table on the basis of the reported distribution of the equivalent total in 1971 and 1973.
[5] Estimated on the basis of 6 months data published in: United Nations Quarterly Bulletin of Steel Statistics for Europe 1973, v. 24, No. 4, New York, 1974, p. 20.
[6] Items reported under this heading are produced from semimanufactures listed above and possibly also from similar imported semimanufactures. Therefore these data are not additive to total semimanufactures listed.
[7] Partial figure, representing only that vanadium in exported slags; does not include vanadium produced for domestic consumption in any form or for export in any form except slag.
[8] Run-of-mine coal; the average ash content of coal shipped from mines was over 20%, and the average calorific value was a little more than 5,000 kilocalories per kilogram in 1973.
[9] Source: United Nations: Annual Bulletin of Coal Statistics for Europe, 1974, v. 9, New York, 1975, pp. 31, 57.
[10] Not distributed by type, and therefore not suitable for conversion to volumetric units.

## TRADE

Soviet foreign trade is a State monopoly, run by more than 60 commodity-oriented trading organizations under the supervision of the Ministry of Foreign Trade. Political objectives exert a strong, and often determining, influence on foreign trade. The Soviet Union trades with 112 countries, and in 89 cases the trade is based on interstate agreements. Soviet foreign trade continued to be oriented toward the importation of needed machinery and equipment, including complete industrial plants. Exports of minerals produce foreign exchange to help pay for imports, even though most minerals exported could be consumed within the country.

Soviet foreign trade turnover (exports plus imports) in 1974 reached 39.6 billion rubles, an increase of 8.3 billion rubles or 26.2%, primarily as a consequence of inflated prices. Major price increases for basic Soviet exports to Western developed countries, in percent, were as follows: Crude oil, 20; petroleum products, 67; natural gas, 39; chrome ore, 70; copper, 46; aluminum, 24; ferrous metals, 12; and mineral fertilizers, 38. Foreign trade turnover in 1975 is to be increased by 13% over that of 1974.

Exports increased 4.9 billion rubles to 20.8 billion rubles while imports increased 3.3 million rubles to 18.8 million rubles.

Soviet trade turnover by country group, in billion rubles, was as follows:

| | 1973 | 1974 | 1974 (percent of 1973) |
|---|---|---|---|
| Countries with centrally planned economies | 18.3 | 21.4 | 116.7 |
| Of these COMECON countries | 16.9 | 19.3 | 114.4 |
| Western developed countries | 8.3 | 12.4 | 148.7 |
| Developing countries | 4.7 | 5.8 | 123.5 |
| Total | 31.3 | 39.6 | 126.2 |

The volume of total official trade with leading Western, developed countries, in million rubles, follows:

| | 1972 | 1973 | 1974 |
|---|---|---|---|
| Germany, West | 827 | 1,210 | 2,209 |
| Japan | 816 | 994 | 1,683 |
| Finland | 602 | 777 | 1,540 |
| Italy | 468 | 614 | 1,137 |
| France | 544 | 722 | 941 |
| United Kingdom | 558 | 715 | 890 |
| United States | 538 | 1,161 | 742 |
| Netherlands | 222 | 356 | 571 |

Soviet figures for foreign trade in 1974 provide abundant evidence of the declining importance of the centrally planned economy countries in the Soviet Union's external trade. Whereas trade with the centrally planned economy countries in 1971 represented 65.4% of the total, it was only 58.5% in 1973 and 54% in 1974. Trade with COMECON countries declined from 59.6% of the total in 1972 to 54% in 1973 and to about 50% in 1974.

Soviet official trade turnover with COMECON countries, in million rubles, was as follows:

| Country | 1972 | 1973 | 1974 |
|---|---|---|---|
| Germany, East | 3,705 | 3,965 | 4,315 |
| Poland | 2,803 | 3,000 | 3,584 |
| Czechoslovakia | 2,626 | 2,760 | 3,029 |
| Bulgaria | 2,345 | 2,555 | 2,904 |
| Hungary | 1,882 | 2,064 | 2,282 |
| Romania | 1,053 | 1,130 | 1,191 |
| Cuba | 822 | 1,110 | 1,642 |
| Mongolia | 287 | 338 | 404 |

Official trade with Yugoslavia increased from 569 million rubles in 1972 to 671 million rubles in 1973 and to 1,240 million rubles in 1974. Trade with North Vietnam was 236 million rubles (compared with 180 million in 1973), with North Korea 343 million rubles, and with the PRC 214 million rubles (up from 201 million in 1973).

The Soviet Union has signed agreements with more than 70 developing countries. The official trade turnover with leading nations in 1973 and 1974, in million rubles, follows:

| Country | 1973 | 1974 |
|---|---|---|
| Egypt | 541 | 728 |
| India | 589 | 615 |
| Iran | 275 | 496 |
| Iraq | 332 | 453 |
| Brazil | 126 | 202 |
| Syria | 119 | 172 |
| Algeria | 117 | 172 |
| Argentina | 77 | 137 |
| Nigeria | 40 | 92 |

**Table 2.—U.S.S.R.: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal: | | | |
| Unwrought | 455,400 | 518,300 | Hungary 112,700; East Germany 110,100; Czechoslovakia 90,300; Japan 47,400. |
| Semimanufactures, rolled only | 117,000 | 114,400 | Czechoslovakia 13,700; Poland 10,723; Bulgaria 8,996; Cuba 5,700. |
| Antimony, unwrought | 105 | 1,054 | Bulgaria 700. |
| Cadmium, unwrought | 1,338 | 1,088 | Netherlands 693; East Germany 193. |
| Chromium, chromite ore and concentrate thousand tons | 1,100 | 1,200 | United States 281; West Germany 180; Sweden 180; Poland 121; Japan 113. |
| Copper and copper alloys: | | | |
| Unwrought: | | | |
| Unalloyed | 202,100 | 237,700 | Czechoslovakia 37,700; Hungary 31,300; Netherlands 27,800; West Germany 18,859. |
| Alloyed | 7,100 | 8,700 | West Germany 7,265; Netherlands 809. |
| Semimanufactures, rolled only: | | | |
| Unalloyed | 13,200 | 8,400 | Cuba 3,366; Czechoslovakia 805; Poland 581; Bulgaria 534. |
| Alloyed | 11,600 | 9,100 | Romania 1,928; Cuba 1,065; North Vietnam 122. |
| Iron and steel: | | | |
| Iron ore thousand tons | 38,400 | 41,400 | Czechoslovakia 11,542; Poland 11,078; Hungary 3,623; East Germany 2,732. |
| Scrap do | 1,600 | 1,820 | Italy 533; Japan 316; Spain 226; East Germany 211. |
| Pig iron do | 5,100 | 5,200 | Poland 1,482; East Germany 860; Czechoslovakia 838; Romania 478. |
| Ferroalloys: | | | |
| Ferrochrome | 48,700 | 46,400 | NA. |
| Ferromanganese | 129,700 | 135,000 | NA. |
| Ferrosilicon | 139,300 | 148,400 | NA. |
| Ferrovanadium | 1,300 | 1,200 | NA. |
| Silicochrome [1] | 1,585 | 2,688 | NA. |
| Silicomanganese [1] | 9,715 | 11,204 | NA. |
| Other (unspecified) | 83,300 | 89,908 | NA. |
| Total | 413,600 | 434,800 | Czechoslovakia 112,900; Romania 96,400; Hungary 42,300; United Kingdom 24,600. |
| Ingots and other primary forms thousand tons | r 1,082 | 1,073 | Romania 301; Hungary 194; East Germany 136; Arab Republic of Egypt 100. |
| Steel semimanufactures: | | | |
| Angles, shapes, and sections do | r 1,726 | 1,714 | East Germany 417; Bulgaria 356; Hungary 156; Poland 154. |
| Wire rod do | 487 | 565 | East Germany 167; Hungary 86; Romania 82; Poland 82. |
| Plate do | r 2,027 | 1,846 | East Germany 983; Czechoslovakia 173; Bulgaria 126; Hungary 119. |

See footnotes at end of table.

## Table 2.—U.S.S.R.: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Steel semimanufactures—Continued | | | |
| Sheet: | | | |
| Tin plate—thousand tons | 94 | 91 | Cuba 31; Bulgaria 25; East Germany 18; Yugoslavia 5. |
| Other—do | 975 | 993 | East Germany 533; Poland 128; Hungary 82; Bulgaria 76. |
| Strip—do | 10 | 10 | Romania 4; Yugoslavia 3; Bulgaria 2. |
| Railway track material—do | 403 | 338 | East Germany 181; Poland 54; Bulgaria 44; Arab Republic of Egypt 20. |
| Wheels, tires, and axles—do | r 72 | 58 | Poland 38; East Germany 18; Finland 1. |
| Pipes, tubes, and fittings—do | 373 | 344 | East Germany 176; Bulgaria 55; Cuba 37; Iraq 6. |
| Wire—do | 75 | 74 | Cuba 21; East Germany 16; Bulgaria 7; Burma 4. |
| Lead, unwrought | 92,600 | 97,000 | East Germany 45,000; Czechoslovakia 25,100; Hungary 12,100; Finland 7,000. |
| Magnesium metal, unwrought | 19,900 | 23,300 | West Germany 8,345; East Germany 3,004; Netherlands 2,333; Czechoslovakia 973. |
| Manganese: | | | |
| Ore and concentrate: | | | |
| Metallurgical grade—thousand tons | 1,300 | 1,300 | Poland 465; Czechoslovakia 331; East Germany 165; Bulgaria 108. |
| Battery and chemical grade—do | 14 | 9 | East Germany 2; Netherlands 2; Poland 1; Czechoslovakia 1. |
| Metal [1] | -- | 22 | All to Sweden. |
| Tin alloy, babbit [1]—long tons | 5 | 16 | All to Mongolia. |
| Vanadium slag | 37,500 | 42,800 | NA. |
| Zinc, unwrought | 133,100 | 146,400 | East Germany 40,700; Czechoslovakia 33,100; Netherlands 25,700; United Kingdom 14,000. |
| Nonferrous metals, unspecified: | | | |
| Unwrought | r 45,112 | 50,691 | NA. |
| Semimanufactures, rolled: | | | |
| Bimetal | 2,600 | 2,700 | Mainly to Bulgaria. |
| Other | 2,300 | 2,400 | NA. |
| NONMETALS | | | |
| Abrasives, hard alloys | 104 | 107 | Romania 63; Bulgaria 20; Hungary 10; Poland 9. |
| Asbestos—thousand tons | 433 | 449 | Poland 63; France 45; Japan 45; East Germany 44. |
| Cement, hydraulic—do | 2,100 | 3,300 | Hungary 597; Czechoslovakia 434; Poland 417; Algeria 334. |
| Clays and clay products: | | | |
| Refractory clays and baked slate | 44,500 | 55,400 | Poland 46,100; Hungary 9,680. |
| Refractory products, including magnesite products | 103,800 | 123,200 | Bulgaria 27,100; Cuba 23,100; Romania 16,800; Japan 5,361. |
| Fertilizer materials: | | | |
| Crude phosphatic: | | | |
| Apatite ore—thousand tons | 27 | 25 | All to East Germany. |
| Apatite concentrate—do | 6,300 | 6,600 | East Germany 1,195; Poland 984; West Germany 965; Romania 589. |
| Manufactured: | | | |
| Nitrogenous: | | | |
| Urea—do | 365 | 318 | Turkey 101; Cuba 60; India 43; Chile 22. |
| Other—do | 1,063 | 975 | Czechoslovakia 259; Cuba 256; Yugoslavia 143; Hungary 103. |
| Phosphatic—do | 509 | 493 | Bulgaria 182; Cuba 139; Hungary 138. |
| Potassic—do | 4,100 | 4,800 | Poland 1,876; Belgium 557; Hungary 473; Japan 378. |

See footnotes at end of table.

## Table 2.—U.S.S.R.: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fluorspar (cryolite only) | 3,200 | 2,000 | Hungary 1,000; Yugoslavia 884. |
| Graphite [1] | 2,605 | 2,388 | All to East Germany. |
| Gypsum [1] | 21,000 | 21,700 | All to Finland. |
| Salt | 275,900 | 279,700 | Czechoslovakia 103,900; Hungary 87,500; Finland 49,000; Denmark 27,200. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 32,900 | 31,200 | Cuba 23,600; Arab Republic of Egypt 4,000; North Vietnam 2,562. |
| Soda ash | 74,400 | 64,300 | Czechoslovakia 17,200; Turkey 12,800; Iran 12,535; Cuba 10,100. |
| Sulfur and pyrites: | | | |
| Pyrite, gross weight thousand tons | 1,600 | 1,600 | West Germany 430; Italy 392; Czechoslovakia 199; Yugoslavia 170. |
| Sulfur, elemental do | 405 | 440 | Cuba 144; Czechoslovakia 140; Hungary 77; India 21. |
| Sulfuric acid do | 219 | 161 | Czechoslovakia 119; East Germany 40; Mongolia 1. |
| Talc [1] | 3,977 | 1,444 | All to Japan. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | 60,200 | 75,500 | East Germany 22,600; Bulgaria 15,000; Czechoslovakia 13,600; Hungary 10,320. |
| Coal: | | | |
| Anthracite thousand tons | 4,200 | 4,400 | France 911; Czechoslovakia 398; Belgium 269; Italy 180. |
| Bituminous do | 20,200 | 20,000 | East Germany 3,636; Japan 2,827; Czechoslovakia 2,280; Italy 1,666. |
| Unspecified do | -- | 100 | NA. |
| Coke do | 4,500 | 4,800 | Romania 1,332; East Germany 1,077; Hungary 638; Finland 603. |
| Gas, natural million cubic feet | 179,063 | 240,140 | Czechoslovakia 83,438; Poland 60,374; Austria 57,273. |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 560,070 | 626,955 | |
| Refinery products: | | | |
| Gasoline do | 38,250 | 46,750 | |
| Kerosine and jet fuel do | r 18,600 | 17,825 | |
| Distillate fuel oil do | r 92,504 | 105,932 | |
| Residual fuel oil do | 73,926 | 69,264 | |
| Lubricants do | 1,654 | 1,747 | Czechoslovakia 12.1%; East Germany 11.0%; Poland 10.4%; Finland 8.5%; Bulgaria 7.9%; Italy 7.3%; Cuba 6.3%; Hungary 5.3%; West Germany 4.9%; France 4.5%.[2] |
| Other: | | | |
| Liquefied petroleum gas [1] do | 734 | 1,266 | |
| Paraffin do | 342 | 462 | |
| Asphalt and bitumen do | 133 | 118 | |
| Petroleum coke do | 597 | 843 | |
| Unspecified do | -- | 827 | |
| Total do | r 226,740 | 245,934 | |
| Crude chemicals from coal, gas, and oil distillation thousand tons | 449 | 454 | West Germany 74; East Germany 66; France 66; Italy 61; Romania 22. |

r Revised. NA Not available.

[1] Data possibly incomplete; total not reported. Totals given represent sum of quantities under individual countries.

[2] Details on destination of crude oil and the various refinery products are not reported individually. Total exports of these commodities are reported on a tonnage basis by destination, but are not convertible to a barrel basis owing to the varying specific gravity of the different commodities that constitute the total. Therefore, country detail given under the heading "Principal destinations" is based on the percentage of the total accounted for by major recipients.

## Table 3.—U.S.S.R.: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite ---- thousand tons | 1,714 | 1,473 | Yugoslavia 690; Greece 635; Turkey 148. |
| Alumina ---- do | 698 | 903 | Hungary 345; United States 206; Guyana 134; Jamaica 79. |
| Metal and alloys, semimanufactures do | 2,800 | 2,000 | Austria 1,066; West Germany 339; Finland 172. |
| Antimony, unwrought [1] | 1,030 | 1,412 | Yugoslavia 1,162; People's Republic of China 250. |
| Bismuth, unwrought [1] | 70 | -- | |
| Cadmium, primary forms | 233 | 248 | Poland 214; North Korea 34. |
| Copper: | | | |
| Concentrate [1] | -- | 19,100 | All from Chile. |
| Unwrought, unalloyed | 8,800 | 6,100 | Chile 5,997. |
| Semimanufactures: | | | |
| Powder [1] | 880 | 1,200 | All from West Germany. |
| Rolled: | | | |
| Unalloyed | 6,200 | 6,400 | Yugoslavia 3,766; Switzerland 771; United Kingdom 25. |
| Alloyed | 10,200 | 7,200 | Yugoslavia 2,523. |
| Iron and steel: | | | |
| Scrap ---- thousand tons | 15 | 15 | All from Mongolia. |
| Pig iron ---- do | 158 | 333 | India 303; North Korea 30. |
| Ferroalloys ---- do | 18 | 19 | Norway 11; North Korea 1. |
| Semimanufactures: | | | |
| Pipe ---- do | 1,500 | 2,000 | West Germany 720; Italy 323; France 236; Japan 150; Romania 139. |
| Wire ---- do | 1 | 7 | NA. |
| Other, rolled only ---- do | 2,603 | 3,150 | West Germany 630; Belgium 475; Japan 370; Romania 354; France 199. |
| Lead: | | | |
| Ore [1] | 39,900 | 44,900 | All from Iran. |
| Metal, unwrought | 50,400 | 59,300 | Yugoslavia 21,800; United Kingdom 17,317; North Korea 9,585; Bulgaria 1,547. |
| Mercury ---- 76-pound flasks | 1,450 | -- | |
| Tin: | | | |
| Ore and concentrate [1] long tons | 318 | 5,739 | All from Bolivia. |
| Metal, unwrought ---- do | r 4,234 | 4,039 | Malaysia 1,585; United Kingdom 1,125; Bolivia 601; People's Republic of China 501. |
| Tungsten concentrate | r 6,568 | 4,823 | People's Republic of China 3,650; Mongolia 10. |
| Zinc: | | | |
| Ore [1] | 24,300 | 26,900 | All from Iran. |
| Concentrate [1] | 3,508 | 17,822 | Bolivia 15,000; North Korea 2,822. |
| Metal: | | | |
| Unwrought: | | | |
| Unalloyed | 50,600 | 44,800 | Poland 38,300; North Korea 6,531. |
| Alloyed | 3,900 | 3,926 | All from Poland. |
| Semimanufactures: | | | |
| Dust | r 1,123 | 1,300 | Mainly from Poland. |
| Rolled | 6,500 | 6,900 | North Korea 3,116; Poland 1,187. |
| Other metals, n.e.s.: | | | |
| Unwrought | r 367 | 7,444 | NA. |
| Semimanufactures | 1,064 | 2,400 | NA. |
| **NONMETALS** | | | |
| Barite | 231,900 | 261,900 | North Korea 83,400; Bulgaria 70,000; Yugoslavia 33,800; Romania 14,700. |
| Cement, hydraulic ---- thousand tons | 460 | 544 | North Korea 480; Mongolia 34. |
| Clay products, refractory, n.e.s.[1] | 655 | 923 | All from France. |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous, ammonium nitrate [1] thousand tons | 15 | 15 | All from North Korea. |
| Phosphatic, superphosphate do | 556 | 110 | NA. |
| Fluorspar | 234,900 | 391,000 | Mongolia 239,800; People's Republic of China 49,200; Thailand 41,300; Japan 34,600. |

See footnotes at end of table.

Table 3.—U.S.S.R.: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Magnesite: | | | |
| Crude [1] | 26,000 | 25,500 | All from North Korea. |
| Powder | 341,800 | 378,600 | Do. |
| Mica | 539 | 160 | All from India. |
| Quartz: [1] | | | |
| Natural, for smelting kilograms | 289,000 | 394,000 | All from Switzerland. |
| Optical grade do | 2,000 | -- | |
| Piezoelectric do | 2,200 | 11,400 | All from Switzerland. |
| Salt [1] | 107,200 | 99,400 | All from People's Republic of China |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 164,800 | 173,500 | Italy 70,000; Romania 34,000; Netherlands 30,100; Belgium 14,800. |
| Soda ash | 465,100 | 271,000 | Romania 166,500; Poland 71,600; United Kingdom 9,100; Bulgaria 6,700. |
| Caustic potash | 10,800 | 4,100 | West Germany 2,700; East Germany 1,200. |
| Sulfur | 151,000 | 468,300 | Poland 458,200; Canada 10,200. |
| Talc | 38,600 | 44,900 | North Korea 34,900; Bulgaria 9,500. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | r 1,010 | 1,000 | All from East Germany. |
| Coal, bituminous thousand tons | 9,700 | 10,000 | Mainly from Poland. |
| Coke do | 612 | 666 | Do. |
| Gas, natural million cubic feet | 390,100 | 403,096 | Iran 306,514; Afghanistan 96,582. |
| Petroleum: | | | |
| Crude oil thousand 42-gallon barrels | r 57,936 | 98,264 | Iraq 82,058; Libya 13,044; Syria 1,714; Arab Republic of Egypt 1,448. |
| Refinery products: | | | |
| Gasoline do | 2,854 | 4,519 | |
| Kerosine do | 1,335 | 1,342 | |
| Distillate fuel oil do | 1,018 | 1,073 | |
| Residual fuel oil do | 3,296 | 2,776 | |
| Lubricants do | 877 | 803 | |
| Other: | | | |
| Solvents do | r 192 | 203 | Romania 34.8%; Poland 27.8%; Cuba 7.6%.[2] |
| Paraffin do | 42 | 24 | |
| Asphalt and bitumen do | 2 | NA | |
| Unspecified do | r 20 | 622 | |
| Total do | r 9,636 | 11,362 | |

r Revised. NA Not available.
[1] Data possibly incomplete; total not reported. Totals given represent sum of quantities reported under individual countries.
[2] Details on origins of various refinery products are not reported individually. Total imports of these commodities are reported on a tonnage basis by source, but are not converted to a barrel basis owing to the varying specific gravity of the different commodities that constitute the total; therefore, country detail given under the heading "Principal sources" is based on the percentage of the total accounted for by major exporters.

Fuels, minerals, and metals continued to account for a large part of Soviet exports, comprising about 44% of the total official exports in 1974.

Soviet exports of selected mineral commodities by group of countries are presented in table 4.

## Table 4.—U.S.S.R.: Exports of selected mineral commodities by country group

(Thousand metric tons)

| Year and commodity | COMECON countries | Other centrally planned economy countries | Total centrally planned economy countries | Developed market economy countries | Developing market economy countries | Total market economy countries | Total exports |
|---|---|---|---|---|---|---|---|
| 1973: | | | | | | | |
| Coal | 14,300 | 1,400 | 15,700 | 8,300 | 500 | 8,800 | 24,500 |
| Crude oil and products | 63,100 | 4,700 | 67,800 | 47,500 | 3,000 | 50,500 | 118,300 |
| Iron ore | 36,400 | 100 | 36,500 | 4,900 | -- | 4,900 | 41,400 |
| Manganese ore | 1,099 | 40 | 1,139 | 159 | -- | 159 | 1,298 |
| Chromium ore | 266 | 36 | 302 | 949 | -- | 949 | 1,251 |
| Pig iron | 4,275.5 | 28.8 | 4,304.3 | 755.5 | 147.9 | 903.0 | 5,207.7 |
| Rolled steel | 5,432.7 | 379.6 | 5,812.3 | 148.2 | 592.9 | 741.1 | 6,553.4 |
| Steel pipe | 284.1 | 5.2 | 289.3 | 25.2 | 29.8 | 55.0 | 344.3 |
| Copper | 134.8 | .2 | 135.0 | 101.4 | 1.3 | 102.7 | 237.7 |
| Lead | 89.4 | .6 | 90.0 | 7.0 | -- | 7.0 | 97.0 |
| Aluminum | 379.1 | 10.5 | 389.6 | 123.7 | 5.0 | 128.7 | 518.3 |
| Fertilizers: | | | | | | | |
| Phosphorus | 493.3 | .4 | 493.7 | .1 | -- | .1 | 493.8 |
| Potassium | 2,953 | 286 | 3,239 | 1,469 | 66 | 1,535 | 4,774 |
| Nitrogen | 652.6 | 188.7 | 841.3 | -- | 133.8 | 133.8 | 975.1 |
| 1974: | | | | | | | |
| Coal | 14,900 | 1,600 | 16,500 | 9,200 | 500 | 9,700 | 26,200 |
| Crude oil and products | 66,700 | 5,000 | 71,700 | 40,200 | 4,300 | 44,500 | 116,200 |
| Iron ore | 37,400 | 200 | 37,600 | 5,700 | -- | 5,700 | 43,300 |
| Manganese ore | 1,123 | 47 | 1,170 | 312 | -- | 312 | 1,482 |
| Chromium ore | 280 | 58 | 338 | 801 | -- | 801 | 1,139 |
| Pig iron | 4,525.6 | 30.6 | 4,556.2 | 234.6 | 119.5 | 354.1 | 4,910.3 |
| Rolled steel | 5,492.3 | 432.6 | 5,924.9 | 66.6 | 445.0 | 511.6 | 6,436.5 |
| Steel pipe | 259.0 | 14.3 | 273.3 | 20.9 | 27.6 | 48.5 | 321.8 |
| Copper | 131.2 | .4 | 131.6 | 114.3 | 2.1 | 116.4 | 248 |
| Lead | 86.8 | .6 | 87.4 | 8.1 | -- | 8.1 | 95.5 |
| Aluminum | 367.3 | 28.7 | 396.0 | 127.8 | 4.9 | 132.7 | 528.7 |
| Fertilizers: | | | | | | | |
| Phosphorus | 517.9 | .3 | 518.2 | .1 | -- | .1 | 518.3 |
| Potassium | 3,241 | 424 | 3,665 | 1,856 | 59 | 1,915 | 5,580 |
| Nitrogen | 603.2 | 170.9 | 774.1 | 26.7 | 179.6 | 206.3 | 980.4 |

Source: Vneshnyaya torgovlya (Foreign Trade), Moscow. No. 6, June 1975, pp. 51–55.

Exports of crude oil and petroleum products declined from 118 million tons in 1973 to 116 million tons in 1974 and comprised 70% crude oil and 30% refined products. Soviet oil exports to centrally planned economy countries increased from 68 million tons in 1973 to 72 million tons in 1974. Exports of crude oil and products to market economy countries decreased from 50 million to 45.5 million tons. Exports of natural gas increased from 6.8 billion cubic meters in 1973 to 14 billion cubic meters in 1974, and those of coal and anthracite increased from 24.5 million to 26.2 million tons. Electric power exports increased from 9.9 billion to 10.9 billion kilowatt-hours for the same period.

Exports of copper increased in 1974 to 248,000 from 237,700 tons in 1973, and aluminum exports increased to 528,700 from 518,300 tons. Exports of lead decreased from 97,000 to 95,500 tons in 1974, while pig iron exports decreased from 5.2 million to 4.9 million tons.

Since 1970, petroleum exports to Western countries have hardly varied (44 million to 47 million tons per year), but shipments to centrally planned economy countries have been increasing consistently. Sales to Western countries are unlikely to change significantly over the next 5 years.

The Soviet Union intends to increase its deliveries of natural gas to West European countries. A second pipeline is to be constructed along the route of the present international gasline, together with four new compressors and five distribution sections. It is expected that the annual capacity of the line will reach 28 billion cubic meters by 1978. This will also permit increased gas deliveries to Czechoslovakia and the beginning of deliveries to Yugoslavia.

Most of the U.S.S.R.'s 1974 export trade in minerals was with Europe and Japan. Since 1972, West Germany has ranked first in Soviet trade with developed Western countries. Trade between Finland and the U.S.S.R. amounted to over 1.5 billion rubles in 1974 and is to be increased by 10% in 1975.

Although Soviet-French trade has grown an average of more than 20% each year over the past 3 years, it accounted for only 2.4% of Soviet foreign trade in 1974—much less than that with West Germany or Finland. The U.S.S.R. is increasing its exports of petroleum to France from about 1 million tons in 1974 to over 1.6 million tons in 1975. U.S.S.R.-United States trade exceeded $1 billion in 1974. Reportedly, the Bank of America has offered to form a banking syndicate to lend the Soviet Union up to $500 million to finance imports from the United States. The Export-Import Bank's loans to the U.S.S.R. were recently limited to $300 million. In 1974 exports from the United States to the Soviet Union totaled approximately $700 million.

Soviet-Belgian trade increased 100% in the past 3 years reaching a level of over 500 million Belgian francs. This is about half as much as Soviet-French trade. In the past 5 years the United Kingdom has fallen to sixth place in trade with the U.S.S.R., behind West Germany, Japan, Finland, Italy and France. However according to preliminary figures trade with the United Kingdom increased by almost 25% in 1974 and is nearing an annual figure of 900 million rubles. Soviet-Canadian trade has doubled in the past 5 years.

Among the developing countries, Egypt, India, Iran, Iraq, Brazil, Syria, and Algeria were the most important trading partners in 1974. In the trade with developing countries, the Soviet Union gives preference to State-owned economic agencies. In some developing countries, Soviet-aided enterprises are the cornerstone of industrial growth and repayment is often made in minerals.

The Soviet Union provides nearly 100% of the COMECON countries' imports of crude oil, natural gas, pig iron, and electric power, 66% of their petroleum products, rolled ferrous metals, and phosphorus fertilizers, 60% of coal and manganese ore, and up to 90% of iron ore. Exports of Soviet petroleum to COMECON members will rise from 138 million tons during the 1966–70 period to some 243 million tons between 1971 and 1975; similarly natural gas exports will rise from 8 billion cubic meters to about 30 billion cubic meters. In 1974, Soviet-Yugoslavian trade reached a value of $1.4 billion. It is anticipated that trade turnover in 1975 may exceed $2 billion. The U.S.S.R. will supply Yugoslavia with petroleum, coal, metals, and other raw materials. Yugoslavia will provide bauxite, nonferrous metals, and other goods. Soviet trade with Cuba rose from 160 million

rubles in 1960 to 1,642 million rubles in 1974. Soviet exports to Cuba include ferrous and nonferrous metals, petroleum (over 7.6 million tons in 1974), anthracite, coke, sulfur, mineral fertilizers, etc. In addition to other goods, Cuba delivers nickel concentrates to the Soviet Union.

While most of the Soviet mineral trade has hitherto been with the other centrally planned economy countries, the U.S.S.R. is now aiming at increased exports to Western countries and especially to the United States.

Mineral commodity imports in 1974 included ferrous and nonferrous semimanufactures, steel pipes, bauxite and alumina, tin, tungsten concentrate, talc, mica, and natural gas. There was a considerable increase in the import of machinery and plants, which mainly came from Western countries.

Trade tables are derived from the official statistics of the Ministry of Foreign Trade for 1971, 1972, and 1973. Official detailed figures for 1974 are not available but much the same general pattern can be expected.

## COMMODITY REVIEW

### METALS

The Ministry of Nonferrous Metallurgy is principally geared to the production of the major metals, and as a result, many byproduct commodities are lost. For example, at the Mednagorsk copper and sulfur complex in the Urals almost all metallurgical slag is dumped; more than 20 million tons have accumulated. Again the Balkhash complex in Kazakhstan recovered only 12% to 13% of the rhenium from the raw material and 36% of lead in dust. Because of poor technology to utilize reverberatory gases, 5.6% of the rhenium, 15.3% of the lead, and 55% of the sulfur is lost.[48]

Beneficiation and metallurgical facilities continued to experience poor metal recoveries; for example, there were 60% losses of metals in concentration and metallurgical processes of copper pyrite ores and concentrates in the nonferrous industry of Bashkir A.S.S.R.[49] During mining, concentration, and metallurgical processing, the Bashkirian nonferrous enterprises lose much zinc, sulfur, and precious metals.[50]

Ore production at many mines remained below planned quotas. Shortcomings in both the ore delineation and the development of many existing mines led to reduced efficiency. Nonfulfillment of shaft sinking and deepening programs and underground development is a continuing problem. Development of the Tishinskiy and Karagalinskiy complexes in Kazakhstan, the Almalyk complex in Uzbekistan, and others has been very slow.[51] Poor maintenance resulted in major breakdowns at the Dzhezkazgan copper complex, the Achinisk alumina plant, and the "Elektrotsink" zinc plant. The Alaverdy complex in Armenia had a high breakdown record.[52]

Output of many refined metal products depends on cooperation between mining, concentration, and metallurgical enterprises which are located at a considerable distance from each other.[53]

The copper and nickel enterprises did not fulfill their 1974 quotas. The plan for placing new facilities in operation was also underfulfilled. Metallurgical plants frequently suffered from shortages in raw materials because of the lag in placing in operation facilities for mining and processing ores.[54]

**Aluminum.**—The Soviet Union is the world's second largest producer of aluminum with probable capacity in January 1975 of 1.8 million tons. Exact production figures are not available, but 1974 estimated production was about 1.56 million tons (including 130,000 tons of secondary), a 5% increase over 1973 output. Production fell short of the 8.2% planned increase, there were shortfalls at the Bratsk aluminum plant, and output did not start at the Regar plant in Tadzhikistan. Under the present 5-year plan, 1975 output is scheduled to be 1.5 to 1.6 times the 1970 level. It is planned to complete construction of the Bratsk and Krasnoyarsk aluminum plants, to put into oper-

[48] Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 1, January 1974, pp. 81–84.
[49] Tsvetnye metally (Nonferrous Metals), Moscow No. 10, October 1973. p. 4.
[50] Work cited in footnote 49.
[51] Tsvetnye metally (Nonferrous Metals). Moscow, No. 2, February 1974, pp. 1–9.
[52] Work cited in footnote 49.
[53] Work cited in footnote 49.
[54] Izvestiya, Moscow. Apr. 25, 1975, p. 3.

ation the first stage of the Regar plant in Tadzhikistan, and to enlarge facilities at the other aluminum plants during the 1971–75 period. Capital investment for aluminum in the 1971–75 period comprises about one-third of the total in the nonferrous sector. It is planned to import large quantities of bauxite and alumina due to shortages of high-quality bauxite in the U.S.S.R. Soviet output of aluminum may reach 1.65 million tons by 1975 and 2.2 million tons by 1980. Exports increased from 368,900 tons in 1970 to 518,300 tons in 1973 and 528,700 tons in 1974. Planned exports are an estimated 500,000 tons in 1975 and about 800,000 tons in 1980.

Construction continued at the Bratsk, Krasnoyarsk, Irkutsk, and Regar primary aluminum plants. With the commissioning of one potline at the Krasnoyarsk plant in May, almost 50% of the total capacity was completed. Another potline at the same plant was put into operation in December 1974. The new potline at Bratsk, which was due for operation in 1974, was not completed.[55] Construction of the first potline at the Regar plant has been under way for 5 years and was due for completion in 1974, but was not commissioned. As a result a considerable part of the Nurekskoy GES (hydroelectric powerstation) is underemployed.[56] New production facilities for secondary aluminum were put into operation at the Mtsensk, Sukhoy Log, and Khabarovsk plants for secondary nonferrous metals and also at the Kuybyshev Lenin ironworks and steelworks.

Pechiney Ugine Kuhlmann has concluded an agreement with the Soviet Union for the construction of 1-million-ton-per-year alumina plant at Nikolayev on the Black Sea and a 500,000 ton-per-year aluminum primary reduction plant in Siberia. Part of the estimated $1.2 billion cost will be repaid by product shipments to France. Large bauxite mines are under development with Soviet aid in Hungary, Yugoslavia, and Guinea and construction of the Nikolayev alumina plant began in December 1974 to treat imported bauxite.

The shortage of bauxite reserves is limiting the development of the aluminum industry.[57] Development of technology for producing alumina from the Kiya-Shaltyrsk (Belogorsk) nepheline open pit on the border of Krasnoyarsk Kray and Kemerovo Oblast has been given priority. Both the Achinsk alumina-from-nepheline plant in West Siberia and the Kirovabad alumina-from-alunite plant in Azerbaydzhan performed poorly in 1974. Inadequate maintenance at Achinsk caused major breakdowns during the year.[58]

The northern Urals continued to be the main bauxite- and alumina-producing region in 1974; between 1971 and 1973 production from this area increased 25.6%. New facilities for production of 40,000 tons of alumina per year were put into operation at the Ural plant in December.[59] It is planned to increase bauxite production in the northern Urals by 37.6% during 1971–75.[60]

The second largest bauxite and alumina-producing area was Kazakhstan, where the Pavlodar alumina plant No. 1 was among the nation's largest. Plant No. 2 was under construction. Development of the Ayat-2 bauxite mine in Kazakhstan continued in 1974 as a fourth supplier for the Pavlodar plant. Production of bauxite in Kazakhstan is to be doubled by a new open pit to be developed at the Krasnontyabriskiy deposit in Kustanay Oblast'.

After removal of 3 million cubic meters of overburden, the Severoonezhskiy open pit in Arkhangel'skaya Oblast' first produced bauxite in July 1974. A shipment was made for industrial testing to study beneficiation and the production of alumina.[61]

Development of the first stage of the Deak bauxite mine, Veszprem County in Hungary, with an annual capacity of 300,000 tons, was completed in June. The second stage is scheduled for 1976, and part of the output will be shipped to the U.S.S.R. Under the Hungarian plan, 21 billion to 22 billion forints will be spent in Hungary to develop the alumina industry during 1970–85. The program is linked to a Soviet-Hungarian agreement, whereby Hungary delivers alumina to the U.S.S.R.; the agreement includes the construction of a large alumina plant in Hungary.

[55] Pravda, Moscow. Jan. 23, 1974, p. 1.
[56] Sotsialisticheskaya industriya (Socialist Industry), Moscow. June 10, 1973, p. 2.
Pravda, Moscow. April 2, 1975.
[57] Voprosy ekonomiki (Problems of Economics). Moscow, No. 1, January 1974, p. 34.
[58] Work cited in footnote 51.
[59] Stroitel'naya gazeta (Construction Gazette), Moscow. No. 10, October 1974, p. 35.
[60] Gornyy zhurnal (Mining Journal), Moscow. No. 10, October 1974, p. 35.
[61] Rabochaya gazeta (Workers Gazette), Kiev. July 10, 1974, p. 1.

The apatite complex at Kola Peninsula produced about 1.5 million tons of nepheline concentrate in 1974. This was less than one-third of capacity, but the Pikalevo alumina and Volkhov aluminum plants are not able to use the increased quantities of the nepheline product.[62]

The 1974 plan called for bauxite exploration in the Urals, in the region of the Kursk Magnetic Anomaly, Tinanskiy Mountains, Kazakhstan, and Siberia. Reportedly, bauxite deposits were discovered in the Srednetimanskiy mountain ridge, Komi A.S.S.R.

**Antimony.**—The Kadamzhay combine in the Kirgiz S.S.R. remained the principal antimony center, where integrated facilities produced most of country's refined products. Development continued on a new underground level at the mine, and ore extraction is to be doubled in the future. Construction of the second stage of the Aznob mining and concentrating combine (Dzhidzhikrutskiy complex) in Tadzhikistan continued in 1974; on completion it is to be the main Soviet producer of antimony and mercury. An antimony ore deposit associated with gold was under development at Sarylakh in Yakut A.S.S.R., near the Polar circle.

**Beryllium.**—The Soviet Union continued to be one of the world's largest producers and consumers of beryl, beryllium alloys, and metal. There are numerous deposits mainly in Kazakhstan, Kola Peninsula, Transbaykal, Urals, Soviet Far East, and Western Ukraine. Production is being expanded, and the probable level was 1,500 tons of beryl (10% to 12% BeO) in 1974.

**Bismuth.**—In 1974, bismuth was recovered as byproduct of lead smelting in Kazakhstan and other regions of the U.S.S.R., from dust and crude lead at the Balkhashskiy and Mednogorskiy copper complexes, and from tungsten and molybdenum ores. Recovery of metal in concentrate was less than 50% of metal contained in ores. An experimental section for commercial production of metallic bismuth was put into operation at the Far Eastern mining and metallurgical complex in July 1974.

**Cadmium.**—Cadmium is recovered at various Soviet lead and zinc smelters. The region of Kazakhstan recently became an important producer of cadmium. It is planned to obtain large quantity of cadmium from lead slag. Average total cadmium recovery was about 60%.

**Chromium.**—The U.S.S.R. continued to be the world's leading producer and exporter of chromite. About two-thirds of the production was exported, and over 80% of this was destined for Western countries. Approximately one-third was consumed in the U.S.S.R. as follows: Metal production, 45%; refractories, 32%; and chemicals and other products, 23%. Estimated data on production, exports, and consumption of chromite in 1968–69 and 1970–80 are summarized, in thousand tons, in the following tabulation:

| | 1968 | 1969 | 1970 | 1974 | 1975 | 1980 |
|---|---|---|---|---|---|---|
| Production (30% to 56%) $Cr_2O_3$ | 1,270 | 1,700 | 1,750 | 1,950 | 2,000 | 2,250 |
| Exports (48% to 56%) $Cr_2O_3$ | [1]748 | [1]1,144 | [1]1,200 | [1]1,100 | 1,150 | 1,250 |
| Consumption and stocks (30% to 56%) $Cr_2O_3$ | 522 | 556 | 550 | 850 | 850 | 1,000 |

[1] Reported in Soviet sources.

About 94% of total Soviet chromite reserves are situated in Kazakhstan with the balance in the Ural Mountains. The Donskoye operation at Khrom-Tau in Aktyubinsk Oblast', Western Kazakhstan, which produces over 90% of the Soviet output, is the only supplier of high-quality ore in the U.S.S.R. Deposits of chromium ores in the Urals which have a low chromium oxide content (20% to 40%) as well as a low $Cr_2O_3$:FeO ratio are mostly used in the chemical and refractory industries.

The chemical composition of chromium ore at Donskoye, in percent was as follows:

[62] Pages 1–2 of work cited in footnote 19.

| Open pit | $Cr_2O_3$ | FeO | $SiO_2$ | MgO | $Al_2O_3$ | CaO |
|---|---|---|---|---|---|---|
| Yuzhnyy | 51.5 | 13.5 | 6.53 | 15.6 | 7.8 | 0.84 |
| Millionnyy | 52.5 | 13.2 | 4.70 | 17.8 | 8.7 | .40 |
| Geofizicheskiy No. 3 | 44.5 | 10.2 | 9.86 | 22.1 | 6.06 | 2.56 |
| Geofizicheskiy No. 6 | 52.8 | 11.4 | 5.30 | 17.7 | 6.83 | 2.90 |
| Ob'edinennyy | 56.0 | 15.4 | 1.82 | 13.0 | 10.30 | 1.10 |

Source: Stal' (Steel), Moscow. No. 10, October 1974, p. 911.

The grade of most ores is adequate for direct shipping after handpicking. There were two crushing and grinding mills in operation at Khrom-Tau in 1974, which classified ore into the following three sizes: 300 to 100 millimeters; 100 to 10 millimeters; and 10 to 0 millimeters. The first chromite concentrator, with an annual capacity of 1 million tons (300,000 tons of concentrate), was under construction at Donskoye, and the first section went into operation in 1974. The new mill will process lower grade ores that have previously been stockpiled. The Southern open pit, the largest at Donskoye with an annual planned capacity of 400,000 tons of crude ore, began production in 1974. Development of the first underground mine, the 40 Let Kazakhskoy S.S.R.—Molodezhnoye, with an annual capacity of 2 million tons of crude ore, continued at Donskoye and is scheduled for completion in 1980.

During 1976–80, the Soviets plan to bring onstream new ferrochromium production facilities. They are planning to reach an agreement with United States companies on the construction of ferroalloy plants with repayment in production. The Soviets are also negotiating similar projects with several West European and Japanese companies.

Reportedly Soviet chrome ore was selling for $70 to $80 per ton f.o.b. loading point for the 48% $Cr_2O_3$ ore with a 4:1 iron ratio. The price of Soviet chrome ore may double depending on embargo on Rhodesian chrome.

**Cobalt.**—Gross cobalt reserves are estimated at about 100,000 tons of metal content, chiefly in nickel-cobalt ores and in cobalt ores of the Khovu-Aksinsk deposit in Tuva Autonomous Republic. Production continues to be concentrated at the Norilsk (West Siberia), Nikel (Kola Peninsula), and Yuzhuralnikel' (Urals) complexes, at the Ufaley and Rezhsk nickel plants in the Urals, and also at some copper plants. Recovery of cobalt remained low, especially from the copper pyrite ore of Bashkiria.[63] During the 1965–70 period, the extraction of cobalt from ores and concentrate increased 1.3%. The current 5-year plan (1971–75) calls for additional increases in cobalt recovery. Some improvements were achieved in the metallurgy of cobalt at the Yuzhuralnikel' complex in Orsk.

**Copper.**—Production of blister copper in 1974 is estimated at 900,000 tons, including 160,000 tons of secondary copper. The increase is due mainly to enlarged facilities at the Dzhezkazgan complex in Kazakhstan and the Norilsk complex in West Siberia. A large converter at the Norilsk complex, which will increase output by about 20%, was commissioned in April. The ore is supplied from the new Oktyabr'skiy mine. Under the 1971–75 5-year plan, output in 1975 is scheduled to be 35% to 40% over the 1970 level. The plan provides for a 30% increase in copper production in Armenia and a 70% increase in Kazakhstan. Output of blister may reach 950,000 tons by 1975, rising to 1.2 million tons by 1980. Exports increased from 123,000 tons in 1970 to 248,000 tons in 1974. Estimated exports in 1975 are 210,000 tons, rising to about 400,000 tons in 1980.

There was an increase in smelting using oxygen-enriched air blasting in 1974. At the Balkhash complex in Kazakhstan, about 20% of the copper concentrate was smelted directly in converters.

The present level of automation in the copper industry lags much behind the level that has been achieved at Soviet enterprises in other industries.[64] Because of poor maintenance, there were major breakdowns at the Alaverdy plant in Armenia.[65]

Kazakhstan continued to be the main center of copper production, and the Balkhash complex there is the largest producer in the country. The 1971–75 5-year plan calls for a 70% increase in refined copper production in Kazakhastan. In open pit mining, which represented about

[63] Izvestiya, Moscow. Feb. 19, 1974, p. 3.
[64] Pages 81–84 of work cited in footnote 33.
[65] Work cited in footnote 51.

60% of total output in 1974, some 40-ton trucks were introduced. Development of Sayak-2 open pit at the Balkhash complex was not completed in 1974 and was rescheduled for 1975. Development of Sayak-3 open pit began in 1974. Development of underground copper mines at the Dzhezkazgan and Irtysk complexes in Kazakhstan is proceeding slowly.[66]

The first stage of Section 10 of the Dzhezkazgan concentrator was commissioned in March. As a result of the sharp fluctuations in the character of the ore delivered, the content of copper and lead in concentrates decreased during 1974.[67]

The Urals was the second largest copper-producing region. Copper is mined at both open pit mines (Uchalinskiy, Mezhozerskiy, Sibayskiy, and Gayskiy) and underground mines (Degtyarskiy, Karabashskiy, Gayskiy, Imeni III International, and Levikhinskiy). The open pit share has increased from 39.3% in 1958 to 67% in 1973. This is attributed to the development of the Gayskiy, Uchalinskiy, and Ob'edinennyy open pits of the Uchalinskiy complex and the decline of the old Degtyarskiy, Krasnoural'skiy, and Karabashskiy underground mines. This trend is expected to continue although there is a shortage of copper reserves in the Urals.[68]

Construction of the first stage of the Madnueli copper complex in Georgia was not completed in 1974, although concentrate production was planned for January 1975. This is now rescheduled for later in 1975. The second stage is to be completed in 1976. It is planned to develop copper deposits at Udokan in Siberia and Boshchekul'skoye in Kazakhstan in 1976–90.

Flash-smelting plants for copper and nickel from Outukumpu Oy, Finland, are to be delivered to the Norilsk complex in 1976–77. The annual capacity of the smelters will be 550,000 tons of nickel concentrate (100,000 tons of nickel) and 650,000 tons of copper concentrate (200,000 tons of copper). The Soviet Union is to aid India in developing the Mananjkhand copper project in Madhya Pradesh. The first stage of the project, with a yearly capacity of 10,000 tons of copper from 1 million tons of ore, is to be completed in 7 years. The total project envisages 2 million to 3 million tons of ore per year to produce about 25,000 tons of copper.

Soviet experts are assisting in the design and construction of the Erdent copper-molybdenum complex in Mongolia. Ore from the first stage is programed for 1978. Power is to be supplied from the Gusinoozersk thermal powerplant in the U.S.S.R.

**Gold.**—Gold output in 1974 was estimated at 7.3 billion troy ounces. Over two-thirds came from the Soviet Far East and East Siberia (mainly from placers at Kolyma, Aldan, Dzhugdzhur, Indigarka, Yana, and Chukotka); most of the balance came from gold and polymetallic ores in the Urals, Kazakhstan, Armenia, Uzbekistan, and West Siberia. Prompted by higher international prices, the Soviet Union plans to increase production and is importing large-scale equipment from West Europe and the United States. Gold production is estimated at 7.5 billion troy ounces in 1975 and 8.6 billion troy ounces in 1980.

There are no accurate figures, but according to some estimates, Soviet gold exports to the Western World totaled 6.4 billion troy ounces in 1972 and 9.0 billion troy ounces in 1973, the highest since 1965. Exports in 1974 were much below the 1972–73 levels and will probably be similarly low in 1975. Reportedly, the Soviet Bank for foreign trade has concluded an agreement with the Continental Gold Corp. for direct sales to the United States.

Although Soviet sources report reserves sufficient for 16 to 17 years at the present rate of production, extensive prospecting continues. In several main gold-producing regions, plants are being shifted to more distant localities. Several big mines are suffering from lack of reserves, and new mines have been opened in the northeastern parts of Soviet Far East and the Yakut A.S.S.R. In view of the importance of gold in the Soviet economy, an intensive search is in progress. The first Soviet symposium on the mineralogy and geochemistry of gold was held in Vladivostok in September 1974.

Magadan Oblast' continued to be the main center of gold production, but 16 enterprises failed to meet their production quota and 19 did not fulfill their productivity plans in 1974. The Severovostok-

[66] Work cited in footnote 51.
[67] Pages 81–84 of work cited in footnote 33.
[68] Voprosy ekonomiki (Problems of Economics). Moscow, No. 1, January 1974, p. 34.

zoloto (North-Eastern Gold Mining) association had 18 dredges in operation in 1974.

Capital investment in this association totaled 112.5 million rubles in 1974. The 1974 target for construction of new facilities was met, but the building of facilities at the Karamken complex, Dukat mine, and Zapadnopolyanskiy complex did not progress fast enough. The plan for gold extraction of the Severovostokzoloto association in 1975 has been increased, compared with that of 1974, and it will be necessary to increase the volume of stripping 25% to 27% and that of sand washing 15% to 18%.

In Yakut A.S.S.R., the second largest gold-producing region, the Aldanzoloto complex fulfilled its 1974 gold production plan ahead of time. The mines of the Indigirzoloto complex were supplied with new imported trucks, an imported 15-cubic meter scraper and nine Soviet washing installations in 1974.

An old placer mine at Kirovskiy in Amur Oblast', originally opened in 1911, is being renovated; installation of a 250-liter dredge is to begin in 1975. A new dredge at the Aprelskiy section of the Dambuki placer mine in Amur Oblast' began production in June. Installation of a new 250-liter dredge began at the Dzheltulak deposit of the Soloveysk placer mine in this oblast' in July. A second hydraulic installation was commissioned at the Polina Osipenko mine in Khabarovsk Kray in 1974, and a new ore processing section was commissioned at the Taseyevo gold plant of the Baleyzoloto complex in Chita Oblast' in 1974.

The Isakovsk placer mine in the Urals, developed over 150 years ago, fulfilled the 1974 production plan in October; dredge No. 33 has already met the 1975 target. There were four dredges in operation at the Yuzhno-Zaozerskiy mine in the Urals in 1974. The construction of the Zod concentrator is to be completed in 1975.

**Iron Ore.**—The iron and steel industry in the U.S.S.R. operated 71 underground mines and 63 open pits with a total capacity of about 250 million tons of usable ore in 1974. Over 80% of ore production was from open pits nearly half of which came from seven pits, each producing over 10 million tons per year.

Production of usable ore was 225 million tons (425.2 million tons of crude ore), an increase of 9 million tons over that of 1973. Production of usable ore is scheduled to reach 235.5 million tons (original plan was 254 million tons) in 1975. It is estimated that production of usable iron ore will reach 235 million tons in 1975 and 275 million tons in 1980. Exports of iron ore increased from 38.4 million tons in 1972 to 41.4 million in 1973 and 43.3 million tons in 1974. The principal increase was in exports to COMECON countries, which equaled about 90% of the total exports.

There were 91 iron ore concentrating mills, of which 29 had sintering and 4 had pelletizing facilities in operation in 1974.

Iron ore production in the U.S.S.R. is shown in the following tabulation:

| | 1970 | 1974 |
|---|---|---|
| Output (million tons): | | |
| Crude ore | 354.1 | 425.2 |
| Usable ore | 194.7 | 224.8 |
| Concentrates | 120.4 | 143.2 |
| Direct-shipping ore | 74.3 | 81.1 |
| Iron content (percent): | | |
| Crude ore | 32.9 | 32.35 |
| Usable ore | 58.8 | 59.34 |

Source: Gornyy zhurnal (Mining Journal), Moscow. No. 1, January 1975, pp. 3–4.

Direct shipping ore averaged 54% to 55% iron in 1974, and that of ore concentrate averaged 64.3% iron. Agglomerate output reached 148.7 million tons in 1974, and pellets, 23.4 million tons.

In spite of being a large exporter of iron ore, the U.S.S.R. has continuous problems supplying its own plants, both quantitatively and qualitatively.

Agreements on the development of iron ore extraction and ferro-alloy manufacture in the U.S.S.R. and on long-term deliveries of these products to COMECON nations were signed in 1974. Under these agreements, from 1975 to 1978 the COMECON countries will supply the U.S.S.R. with machinery, equipment, and materials necessary for increasing Soviet

iron ore extraction, concentration of ores, and ferro-alloy manufacture. The Soviet Union will increase its supply to COMECON nations of iron ore concentrates and ferroalloys.

At yearend 1971, gross ore resources in the U.S.S.R. totaled 111,000 million tons, averaging 34.8% iron. These were distributed as follows: The Ukraine (31%); European Center (24.4%); Urals (15.7%); Kazakhstan (15.0%); Siberia (7.4%); Northwest (3.0%); Soviet Far East (2.5%); and others (1%).

Gross measured, indicated, and inferred resources of iron ore in place (Soviet categories A+B+C1) totaled 60,200 million tons and averaged 38% Fe; speculative reserves in place (category C2) totaled 50,800 million tons and averaged over 30% Fe. There is a shortage of high-grade iron ore reserves in the U.S.S.R.[69]

Some of the resources contain objectionably high percentages of zinc and arsenic. Large capital investments and research are needed to bring these resources into efficient production.

Soviet iron ore mining is less efficient than equivalent operations in the West. Soviet technical lag in iron ore mining resulted from relative lack of technical knowledge and technically inferior equipment. Despite considerable mechanization, productivity of Soviet miners is much below that of miners in the West. Ore beneficiation in the Soviet iron ore industry is carried out by less advanced methods. Agglomeration techniques are copies of old-fashioned Western sintering, and modern pelletization has still a very limited application.

The Ukraine produced about 56% of Soviet iron ore, and the Krovoy Rog Basin in the Ukraine produced about 90% of that republic's total 1974 output. The Urals was the second largest producer, followed by Kazakhstan, Siberia, the Kursk region, and the Kola Peninsula.

The iron ore for the Kuznetsk complex in Siberia was shipped from six mines. The seventh mine, the Irbinskoye mine, was under development in 1974.

The construction of the Kostomuksha iron ore complex in Soviet Karelia by Finnish companies began in 1973. According to a basic agreement signed in March 1974, three West German companies (Friedr. Krupp GmbH, the Korf Steel group, and Salzgitter A.G.) are to construct an electrometallurgical complex in Staryy Oskol, Belgorod Oblast'. The project will be carried out in two stages; the cost of the first stage is Deutsch mark (DM) DM2,500 million, about US$980 million in 1974. At the same time, the U.S.S.R. is assisting in the construction of iron and steel plants in Poland, Yugoslavia, Egypt, Indian, Pakistan, and other developing countries.

Intensive iron ore exploration covering many Soviet regions was undertaken in 1974.

**Iron and Steel.**—The U.S.S.R. iron and steel industry holds first place in the world in total quantity of iron ore mined, coke, refractories, ferroalloys, and steel pipe produced and second place (after the United States) in steel output. However, under modern conditions not only the quantity of metal produced but also the quality of metals produced is of decisive significance. An increase in the assortment and shape of metal products is also important. If the assortment of rolled steel products proves to be inadequate, then a considerable part of the steel will be inefficiently utilized. Growth in metal demand and constant metal shortages have led the Soviet ferrous metallurgy for a long time in a quantitative direction. Improvement in the shape and dimensions of metal sections is the best source of saving metal.

In the Soviet steel industry productivity calculations are based on tonnage. The plan for production of metal is annually increased by a definite number of tons, regardless of the assortment and length of the sections. Tonnage is also used in evaluating the work of rolling shops and workers.

Each year the plan for rolled steel is overfulfilled, and at the same time millions of tons of rolled products are not supplied on the orders. It must be assumed that the management of Soviet enterprises is not concerned with the needs of the Soviet customers. A great proportion of the rolled products consists of sizes and shapes that are not in large demand. Such a system prevents conservation of metal and makes for wastefulness in metal consumption. Thus shortage of many steel products in the U.S.S.R. is creating a big problem in the Soviet economy.[70]

The poor quality of Soviet iron and

[69] Razvedka i okhrana nedr (Exploration and Conservation of Natural Resources), Moscow. No. 3, March 1972, p. 1.

[70] Rabochaya gazeta (Workers' Gazette), Kiev. Dec. 22, 1971, p. 3.

steel products, of course, significantly, affects other branches of industry, particularly machine construction. The branches of industry dependent upon iron and steel are constantly complaining; their work is dependent on the quality and quantity of the metal they receive, and they are dissatisfied not merely with the lapse in production because of the shortage of metal, but with the fact that the material they do receive does not come up to customer specifications.

The quality of Soviet steel compared with Western or Japanese steel is not quite as high. The majority of plants were built in the 1930's and originally were the typical United States design of that period.

In 1974, estimated production of crude steel at major metallurgical works, in million tons, was as follows:

| | |
|---|---|
| Magnitogorsk complex | 15.0 |
| Krovoy Rog plant | 11.0 |
| Zhadanov Il'rich plant | 7.5 |
| Nizhniy Tagil complex | 6.5 |
| Cherepovets plant | 6.5 |
| Chelyabinsk plant | 6.3 |
| Kuznetsk complex | 5.0 |
| Zaporozhstal' plant | 5.0 |
| Karaganda complex | 5.0 |
| West Siberian plant | 4.5 |
| Other plants (66 plants) | 63.9 |
| Total | 136.2 |

Soviet metallurgical plants have a large proportion of auxiliary workers in production shops. Some spare parts and components for metallurgical equipment are produced in primitive workshops with obsolete equipment. As a result, there are many more repair workers than workers in operation which comprise blast furnaces, steel smelters, and rolling mills.

The ferrous industry failed to meet planned production costs mainly because of overly large consumption of raw materials, supplies, energy, and a large labor force. These excessive consumption uses stemmed from high losses due to defective production.

Production facilities of the industry are technically backward and equipment is obsolete and of low efficiency. Iron ore, pig iron, and steel are obtained as a result of a big outlay of labor and capital, and mechanization of production processes could be greatly improved.

Published Soviet data established that millions of tons of iron and steel were not reaching end users in the form of new products. The June 1974 decree of the Central Committee of the CPSU pointed out that Ministry of Ferrous Metallurgy was not taking the necessary steps to improve quality and broaden the assortment of rolled products, pipe and other metal products, the industry was not complying with the assigned tasks of turning out such items as thin sheets, curved shapes, graded cold-rolled steel, and low-alloy and heat-hardened steel. Production fell considerably short of plan goals for rolled products made of low-alloy steels, for example, principally because of the lack of thermal facilities in metallurgical plants.[71]

Since it generally takes a larger labor-intensive force to produce economical shapes of metal, Soviet enterprises run by a system of planning and economic incentives are more interested in manufacturing the less economic types of steel products.[72]

For about 15 years a system has been under development for planning and accounting for production of rolled goods in adjusted tons (taking labor-intensity into account). Ten years ago it was discussed at a special all-union conference and was approved. But its final revision and introduction into production have been dragged out up to now.

One of the basic shortcomings in the work of many Soviet metallurgical plants is disproportionate development of the individual phases of metallurgical processing, which in turn has tended to increase even further the discrepancy between the primary and final phases of facilities of steel mills.

About 90% of the total tonnage of iron and steel industry products in the U.S.S.R. in 1974 was shipped by rail. The average distance of railroad deliveries of iron and steel commodities in 1974, in kilometers, was as follows:

| | |
|---|---|
| Coke | 874 |
| Iron ore | 702 |
| Ferrous Metals | 1,393 |

Source: Zheleznodorozhnny transport (Railroad Transport), Moscow. No. 3, March 1975, p. 6.

*Capital Investment and Construction.*— The iron and steel industry is one of the

[71] Material'no-tekhnicheskoye snabzheniye (Material-Technical Supply), Moscow. No. 3, March 1974, p. 48. Pravda, Moscow, June 21, 1974. Economicheskaya gazeta (Economic Gazette), Moscow. No. 4, January 1975, p. 2.

[72] Pravda, Moscow. June 21, 1974, p. 1.

most active capital investment areas of the Soviet economy. Over 25 years (1951–75) about 45,000 million rubles have been invested for the development of the Soviet ferrous industry; this represents 3.3% of total investments in the national economy and 8.2% of investments in industry. The active capital in the iron and steel industry as of January 1, 1973, constituted 9.8% of the active capital of the country.

The plan for capital investment in 1975 for the iron and steel industry is set at 4,040 million rubles. Capital investment in the construction of new facilities and enlargement and renovation of existing ones are to be 3,600 million rubles or 11.8% over that of 1974.[73]

In the Soviet iron and steel industry production of metals is increasing at a slower rate than the growth of capital investment, about 3% per year. Incomplete utilization of existing capacities, prolongation of construction projects, and unsatisfactory work of many units and plants are the principal reasons. Unsatisfactory introduction of planned capacities of new units also has pronounced negative effects on the level of returned capital. New units are slow in attaining capacities mainly because actual conditions of their operation do not correspond with their designed and planned utilization.

Many mines and plants have been put into operation despite numerous imperfections and inadequate equipment and have operated over a long period of time with lower capacities than originally planned. Every fourth, new installation does not manage to reach rated capacity because of the low quality of design and equipment defects. For example, the 350 to 500 rolling mill at the Zlatoust metallurgical plant in the Urals was put onstream September 30, 1973. But 6 months later, it reached only 25% of its capacity.[74] By January 1, 1974, planned capacity had not been reached at many blast furnaces, open-hearth shops, and rolling mills.[75]

Because of the shortage of some needed equipment, there has been a rapid increase in stocks at many iron and steel enterprises. Many other iron ore works and metallurgical plants cannot be completed because of a shortage of equipment.[76]

*Pig Iron.*—In 1974, 36 enterprises operating 140 blast furnaces produced 99.9 million tons of pig iron, an increase of 3.9 million tons over the 1973 level. Average blast-furnace capacity is reported at over 1,180 cubic meters. About half of all blast furnaces used oxygen for enrichment; some 85% of the pig iron is being produced by partial use of natural gas and oxygen at 107 blast furnaces. The Cherepovets metallurgical plant, which produced 5 million tons of pig iron and about 6.5 million tons of raw steel, employed 34,000 men and women in 1974.[77] Estimated Soviet output for pig iron for 1975 and 1980 is 105 million and 125 million tons, respectively.

The quality of raw materials at some blast furnaces has deteriorated and the productivity of the furnaces has sharply declined, while at other furnaces breakdowns have become more frequent and the idle time of the equipment has risen.[78]

*Crude Steel.*—Seventy-six metallurgical works produced 136 million tons of raw steel in 1974, 4.7 million tons more than in 1973. It is planned to produce 142 million tons in 1975. Estimated levels for 1975 and 1980 are 142 million and 165 million tons, respectively. Distribution of production by processes, in percent, follows:

| Process | 1960 | 1965 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 |
|---|---|---|---|---|---|---|---|---|---|
| Oxygen converter | 3.8 | 5.0 | 10.2 | 11.8 | 13.7 | 15.3 | 17.1 | 18.0 | 18.3 |
| Electric steel | 8.9 | 4.9 | 4.6 | 4.6 | 9.0 | 10.7 | 11.5 | 12.3 | 13.1 |
| Open hearth | 84.4 | 88.0 | 83.4 | 81.9 | 75.9 | 72.6 | 70.3 | 68.7 | 67.7 |
| Bessemer | 2.9 | 2.1 | 1.8 | 1.7 | 1.4 | 1.4 | 1.1 | 1.0 | 0.9 |

Although several large open-hearth furnaces (600- to 900-ton capacity) were in operation, the average capacity of all (about 400) Soviet furnaces was approximately 245 tons. In 1975, over 80% of the open-hearth steel was produced with the use of oxygen. Almost one-half of Ukrainian open-hearth furnaces employing the latest equipment did not reach rated capacity.

[73] Koks i Khimiya (Coke and Chemistry), Moscow. No. 2, February 1975, pp. 1–4.
[74] Pravda, Moscow, Oct. 19, 1974, p. 2.
[75] Work cited in footnote 26.
[76] Work cited in footnote 28.
[77] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 37, September 1974, p. 2.
[78] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Aug. 24, 1974, p. 1.

At yearend 1974, there were 34 operating oxygen converters, of which 27 had capacities of 100 tons or more. The Soviets have been proceeding slowly on the installation of Linz Donawitz (LD) oxygen converters, although several 300-ton units are in operation. Soviet oxygen furnaces are smaller and less advanced than those in the West, and continuous-casting technology is likewise more advanced in the West.

*Rolled Products.*—Soviet rolled ferrous output in 1974 totaled 109 million tons, of which 94.3 million tons was finished products, a 3% increase over that of 1973. Despite increases in total output, production of many structural shapes remained inadequate. Output of rolled products is measured in tons. Therefore, metallurgical plants prefer to produce heavy types of products and are reluctant to manufacture thin sheet and light sections. Estimated level for 1975 and 1980 are 99.5 million and 115 million tons, respectively.

The general designs of the Soviet rolling mills are similar to United States mills installed 20 to 30 years ago, and many are substantial duplicates. The Soviet rolling and finishing industry is inferior not only in quality of products and plant layout and equipment but also in labor productivity. Of the total rolled steel produced, some 30% came from about 25 rolling mills installed in the 19th century. Automation of Soviet rolling mills lags behind that of the Western countries both in availability of facilities and of systems necessary for automation of rolling equipment.[79]

*Steel Pipe.*—In terms of tonnage the Soviet Union was the largest world producer of steel pipe, with a total of 15 million tons in 1974, a 4% increase over 1973 production. Fabrication, however, is inadequate for internal demand, and more than 10% of requirements have to be imported from West Europe and Japan. About 60% of the total Czechoslovakian pipe production goes to the U.S.S.R. Quality of pipe is poor and does not correspond to state standards. According to Soviet sources, use of incorrect types and sizes of pipe in the gas and petroleum industries resulted in the use of 16% more metal than was necessary. The low quality of pipe which was produced without coating reduced their service life approximately three times. The petroleum industry is compelled to create shops for pipe coating.[80] It is estimated that production of steel pipe may reach 15.7 million tons in 1975 and 19 million tons in 1980.

*Scrap.*—Over 70 million tons of steel and pig iron scrap was remelted in 1974. Approximately 50% of the scrap came from metallurgical works, 22% came from metal fabrication plants, and the remainder was old scrap, mainly unused machines and spare parts. Metallurgical enterprises received mainly light unprocessed scrap which caused difficulties in steel smelting shops. The share of scrap in charge of Martin furnaces was about 45% and that of electric furnaces was some 96%. Soviet ferrous scrap plays an important part in the international scrap trade and for many years the U.S.S.R. exported scrap in quantities to Italy, Japan, Finland, and Sweden.

*Ferroalloys.*—Part of the Soviet effort to improve quality of steel is devoted to ferroalloy plants. The first stage of a plant for producing ferromanganese was commissioned at the Nikopol' ferroalloy plant in Dnepropetrovsk Oblast' (Ukraine) in 1969. There are 12 electric furnaces in this plant. The Zestafani ferroalloys plant in Georgia is also a leading plant for the production of ferromanganese. The Yermak ferroalloys plant in Kazakhstan is a main producer of ferrosilicon. The U.S.S.R. is also an important producer of ferrochromium and ferrovanadium. Large quantities of ferroalloys are produced for export.

*Ferrous Metal Consumption.*—The basic demand for ferrous metals in the Soviet economy came from four sectors: Machine-building and metalworking, construction, railroad transportation, and oil and gas industries. Consumption of ferrous metals by sector in 1974, in percent, was as follows:

| | |
|---|---|
| Machine-building and metalworking industries | 50.3 |
| Other sectors of industry | 10.7 |
| Construction | 32.5 |
| Railway transport | 3.3 |
| Agriculture | .7 |
| Other branches of economy | 2.5 |
| Total | 100.0 |

[79] Work cited in footnote 42.
[80] Izvestiya, Moscow. Aug. 1, 1967, p. 3.

Because of the unbalanced production of some types of rolled products and steel pipes, customers involuntarily adjusted their requirements, by accepting products that were "given" rather than those that were needed.

*Ferrous Metal Trade.*—Iron ore, pig iron, ferroalloys, rolled ferrous products and steel pipe represented about 9% of total official exports in 1974; the share of rolled ferrous products and steel pipe in Soviet official imports was about 8%.

Exports of iron ore increased from 41.1 million tons in 1973 to 43.3 million tons in 1974. Shipments of pig iron decreased from 5.3 million tons in 1973 to 4.9 million tons in 1974, and those of rolled ferrous metal from 6.5 million in 1973 to 6.4 million tons in 1974. But imports of rolled ferrous products and steel pipes increased from 5.2 million tons in 1973 to 7 million tons in 1974.

The Soviet Union provides nearly 100% of the COMECON countries imports of pig iron and rolled ferrous metals and up to 90% of their iron ore.

The total ferrous commodity trade with various groups of countries in 1974, in thousand tons, was as follows:

| Commodity | COMECON countries | Other centrally planned economy countries | Total centrally planned economy countries | Developed market economy countries | Developing market economy countries | Total market economy countries | Total exports |
|---|---|---|---|---|---|---|---|
| Iron ore | 37,400 | 200 | 37,600 | 5,700 | -- | 5,700 | 43,300 |
| Pig iron | 4,526 | 30 | 4,556 | 235 | 119 | 354 | 4,910 |
| Rolled steel | 5,492 | 433 | 5,925 | 67 | 445 | 512 | 6,437 |
| Steel pipe | 259 | 14 | 273 | 28 | 21 | 49 | 322 |

The rolled ferrous products industry does not meet the demand of all sectors of the Soviet economy, and some 10% (in addition to over 10% of steel pipe demand) has to be imported.

*Technology.*—The general level of iron and steel technology in the U.S.S.R. has lagged behind that of the more advanced Western countries. A low degree of mechanization in the U.S.S.R. is characteristic in many processes. Labor-intensive functions of mining and metallurgy occupy large numbers of workers who could be replaced by machinery. A study by G. B. Holland entitled Ferrous Metallurgy Today and Tomorrow described the actual technological level of the Soviet iron and steel industry and waste of metal in the Soviet economy.[81]

According to Holland, the ferrous industry employs 1.75 million workers, including 1.3 million "production" workers and 130,000 graduate engineers and technicians. Every year about 100 million rubles are allocated to scientific research. Eighteen-thousand five-hundred scientists and engineers are employed in research organizations, of which 9,000 are scientists.

The main trend of technological progress in ferrous metallurgy has been to increase the unit capacity of metallurgical units and to increase quantity with little attention to quality. As a result of Soviet technological lag in certain important aspects of steel smelting, much of the ingot is not meeting the high Western standard of product quality. Poor quality steels used in machine construction resulted in the short service life of machinery and equipment and loss of large capital investments.

In the Soviet Union smelting of pig iron exceeds the production of finished rolled products by 5.5% to 6.5%, while in Western countries the production of finished rolled products exceeds the smelting of pig iron by 8% to 10%. In 1973, the output of sheet metal comprised 38.49% (33.6 million tons) of the total Soviet production as compared with 68% in the United States and 62% in Japan. The difference is even greater in the production of cold-rolled sheet to total sheet. Specific consumption of rolled sheet metal compared with graded metal ranges from 20% to 25% less. Moreover, producing cold-rolled sheet and stock with various types of hardening and protective coating makes the metal not only thinner but also tougher. But the volume of coated rolled metal products in the U.S.S.R. is completely inadequate (in 1970 just a little more than 1 million tons); for this reason the average weight of 1 square meter is twice as great as in the United States, and consequently twice as much

[81] Work cited in footnote 38.

metal is consumed in the manufacture of metal products.

The number of shapes and shape dimensions of graded rolled metal is increasing too slowly. For example, in 1970 the quantity of shapes produced was four times smaller than in the United States and the production of curved sections made from sheet metal was 10 times smaller. These facts are directly confirmed by the following quantities of shavings produced in metal working and machine-building: In the United States, 2.9 million tons per year, and in the U.S.S.R. 7 million tons per year.

The ratio between the production of graded and sheet rolled metal, the inadequate assortment of rolled metal, and the slow rise in the quality of the steel have all led to a situation in which Soviet equipment is between 25% and 45% heavier than the equipment of other countries. Thus, the oxygen converter in the Zhadanavo plant weighs 626 tons, while the oxygen converter manufactured in Austria weighs 426 tons. The 1200 Soviet rolling mill weighs 2,200 tons, whereas in the United Kingdom such a mill weighs between 800 and 1,000 tons; a pipe welding mill in the Soviet Union weighs 2,750 tons, whereas one in West Germany weighs 1,000 tons; a continuous miner in the Soviet Union has a weight per ton of coal mined that is 2.5 to 3 times greater than that in the United States. Because of the low volume of production of alloy and low-alloy steel, average toughness of this steel is 25% to 30% lower than world standards; this accounts for the slow rate of improvement in the durability and longevity of Soviet equipment.[82]

Improving the quality of steel and rolled metal by known methods can reduce consumption of metal per unit of finished products and in finishing operations involved in trimming, and reduce the increase in quantity of poorer quality metal used. But the existing system of prices does not stimulate ferrous metallurgy to produce high-quality products.[83]

The shortage of high quality rolled metal and graded products also have adverse effect on the indicators of capital investment and output capital ratio. A 1.5 to 3-fold excess in the weight of metallurgical equipment compared with world standards makes for excessively heavy structures as well as unwieldy and voluminous designs, which take up much space. This results in a 1.5 to 2-fold lengthening of construction time compared with approved rates and a rise in uncompleted construction projects, which increased from 84% in 1965 to 103% in 1970.[84]

The very system of planning the volume of salable products and profits earned from the level achieved, encourages production of rolled stock which in turn gives rise to increased metal-consumption in manufactured products. Users of the metal are not always interested in reducing the weight of manufactured metal items, because this reduces gross production and lowers economic indicators.[85]

In 1970, facilities for producing rolled stock within the Ministry of Ferrous Metallurgy amounted to 81 million tons, against steel production amounting to 115 million tons. With a planned coefficient of steel consumption per ton of rolled stock equal to 1.3, these facilities are hardly sufficient to roll the steel that was smelted. The situation is almost unchanged as 1975 approaches. The inadequacy of facilities for steel smelting and rolling production is one of the basic causes of the restricted production of graded products, and it hinders the rapid introduction of technological innovations and new processes, especially in the renovating of existing enterprises.[86]

The replacement of obsolete equipment in ferrous metallurgy is proceeding slowly. Through industry as a whole, the level of replacement of old equipment is twice as high as in ferrous metallurgy. The steel industry uses a large quantity of obsolete equipment: 43 blast furnaces, 80 open-hearth furnaces, 97 rolling mills, about one-half of the power units, and a large percent of the metal products equipment. Units aged up to 10 years are being used to smelt 31% of the pig iron, 29% of the open hearth steel, and 31% of the finished rolled metal.[87] Out of 200 coking batteries in the U.S.S.R., more than half have been operating for more than 20 years; some for 40 years; many became obsolete or physically worn out long ago.

Technological processes such as the pro-

[82] Work cited in footnote 38.
[83] Work cited in footnote 38.
[84] Work cited in footnote 38.
[85] Work cited in footnote 38.
[86] Work cited in footnote 38.
[87] Work cited in footnote 38.

duction of oxygen converter steel, continuous casting, and measures to improve the quality of the steel and rolled metal require a smaller capital investment to increase production and make it possible to work out new production lines, which further serve to reduce the capital-output ratio. For example, the specific capital expenditures of converter steel production are 28% to 30% lower than those of open-hearth production. In 1960, the production of oxygen converter steel in the Sovet Union, the United States, and Japan was approximately the same, constituting 2.5 million tons, 3.1 million tons, and 2.6 million tons, respectively. From 1960 through 1970, production increased to 58.6 million tons in the United States, 74.0 million tons in Japan, and 15.3 million tons in the Soviet Union. Although scientific technological developments and production volumes were at the same level, the development of converter production was held back in the Soviet Union because preference was given to the familiar open-hearth method. While open-hearth steel smelting increased by 1.5 times in the U.S.S.R., in the United States it decreased by 0.5 times and in Japan 4.5 times.

Continuous steel-casting units boost the output of usable metal by 8% to 17%. Compared with the usual system, they require 8% to 10% less specific capital investment, or 25% to 35% less with the development of radial and curvilinear continous-steel-casting units. The increased volume of continuous casting in the U.S.S.R. is slow—from 1.1 million tons in 1960 to 5.9 million tons in 1972.

Capital investment in finishing operations (heat-hardening, trimming, coating of rolled stock, and improving quality) are smaller than capital investment in new facilities for the production of run-of-mill rolled stock, with a simultaneous savings in the metal consumed for the finished manufactured products. Thus, according to estimates by the Scientific-Research Institute of Economics of Gosplan U.S.S.R. (State Planning Committee of the U.S.S.R.), if metal consumers replace hot-rolled stock in the amount of 35 million tons by higher quality rolled stock and further purified metal items, it would be possible to save 5.6 million tons of rolled stock and reduce capital investment in the Soviet economy by 500 million rubles.[88]

*Efficiency.*—The Soviet steel industry acts like one big company and could be called the world's largest steel-producing organization under a single management. Under the Soviet system, management can dispose of products, and act without regard for consumers needs. With State control and low labor costs the U.S.S.R. is in a position to maximize the use of its domestic resources even at the cost of submarginal production.

Expansion of the Soviet iron and steel industry continues to be achieved mainly through increased labor and capital rather than advanced technology. It is estimated that 2 to 3 times more investment and labor in real terms are required in the U.S.S.R. than in the principal countries of the West to achieve a given increase in metal output. Because of shortages of metals, efforts are directed chiefly toward fulfilling quantitative goals and less attention is paid to quality. The productivity of labor and equipment is below planned levels, and practically all sectors of the iron and steel industry maintained larger production personnel than called for by plan targets. At the root of these problems is apparently technological backwardness in mining, beneficiation and metallurgical processing, and inefficient production and consumption of metals; the Soviet economic system does not generate innovation.

The assortment of rolled stock in the U.S.S.R. is several times smaller than in the developed Western countries. Many analogous shapes in the U.S.S.R. per unit of length for the same area of service weigh more than the foreign ones. Thus, the thickness of tinplate in the U.S.S.R. is approximately double. The quality of Soviet metal products is lower than those of the Western countries. The U.S.S.R. produces significantly less thin-sheet, cold-rolled steel and plate with platings. It does little to use the strengthening heat-treating of metal. Obviously, with such an assortment and such quality of metal products in the U.S.S.R., the U.S.S.R. can manufacture 1.5 to 2 times less machinery, instruments, and consumer goods from ton of metal than the major Western nations.

Approximately one-half of the finished steel produced (including bars, plates, structural shapes, rails, wire, and coated and uncoated sheet steel) reportedly does

[88] Work cited in footnote 38.

not properly meet consumer specifications. Such a situation in the Soviet steel production is caused by the existing system of planning and accounting for output in physical tonnage and also by bonuses for workers for fulfilling the plan in tons.

Careless storage and utilization of metal have been revealed at many Soviet enterprises. Rolled metal products are stored poorly, sheet metal is stocked outdoors, and cut pieces of sheet metal are mixed with other materials. Some of these products have been stored without use for 5 years.[89]

Despite the expansion of iron and steel production in the U.S.S.R. in recent years, the supply of metal has not kept pace with demand. The Soviet Union is consuming much less steel per capita than West Europe at the present time, because growth is measured in tons of metal produced not in tons of metal usefully consumed. Thus, the large gap in the average ferrous metal consumption is expected to be maintained in the future.

The Soviet economy sustains immense losses each year as a result of inefficient output and consumption of ferrous metals. In many sectors of the economy, more ferrous metals are consumed per unit of production than is required with modern technology. The relative growth of the Soviet iron and steel economy, therefore, can best be determined only from a careful and exhaustive study of the pertinent official Soviet publications.

Although the avoidable losses of ferrous metals are not known completely, nor have they been adequately quantified, they have been widely reported in the Soviet press. According to Soviet sources, estimates of avoidable raw steel losses due to inefficient production and consumption of finished limited rolled ferrous metals in the Soviet economy in 1974 were placed, in million tons, as follows:

| | |
|---|---|
| Production of 94.2 million tons of finished rolled products from 136 (minus 0.5% for castings) million tons of crude steel | 8.0 |
| Over one-half of rolled steel produced in the U.S.S.R. is used in machine construction and metal workings plants, almost one-fourth of it is lost in shavings | 10.7 |
| Heavy weight of machinery and equipment (average 35%) | 20.0 |
| Heavy weight of rolled products in construction and other uses | 13.4 |
| Low quality of machinery and equipment shortened the lifetime on the average by 50% | 5.7 |
| Low quality of machinery and equipment requires additional spare parts and repair | 2.9 |
| Unused machines and spare parts remelted as old scrap (10% of the total scrap) | 10.0 |
| Careless storage and utilization of rolled metal (4% of total scrap) | 4.0 |
| Total losses of raw steel | 74.7 |

A careful and exhaustive study of the Soviet publications shows that only about 45% of the total crude steel production is efficiently used in the Soviet economy and 55% is remelted or lost as a result of low technology of the iron and steel industry and inefficient production and consumption of metal.

Soviet iron and steel statistics are presented in table 5.

[89] Agitator (Propagandist), Moscow. No. 2, 1975, pp. 15–16.

Table 5.—U.S.S.R.: Soviet salient iron and steel statistics
(Million metric tons)

| Item | Actual | | | Estimated | |
|---|---|---|---|---|---|
| | 1960 | 1965 | 1970 | 1975 | 1980 |
| Iron ore: | | | | | |
| Domestic output | 105.9 | 153.4 | 195.5 | 235.0 | 275.0 |
| Imports | (1) | (1) | (1) | (1) | (1) |
| Exports | 15.2 | 24.1 | 36.1 | 45.5 | 55.0 |
| Apparent consumption | 90.7 | 129.3 | 159.4 | 189.5 | 220.0 |
| Pig iron: | | | | | |
| Domestic output | 46.8 | 66.2 | 85.9 | 105.0 | 125.0 |
| Imports | .2 | .1 | .7 | .4 | .5 |
| Exports | 1.8 | 3.7 | 4.8 | 5.0 | 6.0 |
| Apparent consumption | 45.2 | 62.6 | 81.8 | 100.4 | 119.5 |
| Crude steel supply | 65.3 | 91.0 | 115.9 | 142.0 | 165.0 |
| Efficiently utilized [2] | 29.3 | 41.0 | 52.0 | 64.0 | 74.0 |
| Waste of metals | 36.0 | 50.0 | 63.9 | 78.0 | 91.0 |
| Rolled finished metal products: | | | | | |
| Domestic output | 43.7 | 61.7 | 80.6 | 99.5 | 115.0 |
| Imports | .9 | .8 | 1.5 | 4.0 | 4.0 |
| Exports | 2.7 | 4.5 | 6.5 | 7.0 | 9.0 |
| Apparent consumption | 41.9 | 58.0 | 75.6 | 96.5 | 110.0 |
| Steel pipe: | | | | | |
| Domestic output | 5.8 | 9.0 | 12.4 | 15.7 | 19.0 |
| Imports | .6 | .8 | 1.3 | 3.0 | 3.0 |
| Exports | .2 | .3 | .3 | .4 | .4 |
| Apparent consumption | 6.2 | 9.5 | 13.4 | 18.3 | 21.6 |
| Ferroalloys: | | | | | |
| Imports | .02 | .006 | .006 | .006 | .006 |
| Exports | .2 | .2 | .4 | .5 | .7 |

[1] Insignificant.
[2] Estimated net consumption according to Western standards.

**Lead and Zinc.**—The Soviet lead and zinc industry is probably the second largest in the world. Estimated output of primary metal in 1974 was 475,000 tons of lead and 680,000 tons of zinc. Ore reserves were estimated in 1974 at 16 million tons of contained lead and 20 million tons contained zinc; over two-thirds are located in Kazakhstan chiefly in the Altay region and in the district of Kara-Tau. There are also large reserves of zinc in the Urals. Estimated production of primary metals in 1975 is placed at 480,000 tons of lead and 690,000 tons of zinc; estimated levels for 1980 are 530,000 and 740,000 tons, respectively. Exports of lead decreased from 97,000 tons in 1973 to 95,000 tons in 1974. Neither lead nor zinc output quotas were reached in 1974 nor in previous years, owing to ore shortages, slow construction of new facilities, and low metal recoveries.[90]

Kazakhstan continued to be the leading lead and zinc producer, and output is to be increased 27.2% and 15.7%, respectively, during 1971–75. Extensive renovation of the Ust'-Kamenogorskiy lead and zinc complex is planned over the next 15 years. Completion of No. 12 blast furnace at the Chimkent lead plant in Kazakhstan was rescheduled for 1975.[91]

Output of zinc at the Almalyk plant increased 6% in 1974 over that of 1973, but the plant continued to experience raw material shortages.[92]

The Ust'-Kamenogorskiy and Leninogorskiy complexes and Chimkent lead plant in Kazakhstan, and some other lead and zinc plants experienced raw material shortages in 1974. The "Elektrotsink" zinc plant in North Caucasus received only 20% to 23% of local raw material from the Sadonskiy complex, the remainder was shipped from other regions over a long distance with 8 times higher transportation costs.[93] Due to the violation of preventive maintenance a breakdown situation was created at the "Elektrotsink" plant in 1974.[94]

Development of the Nikolayevskiy lead, zinc, silver, and bismuth deposit at the Eastern complex in Dal'nogorsk, Primorskiy Kray, continued in 1974. Construction of the Gorevskiy lead and zinc com-

[90] Tsvetnye metally (Nonferrous Metals), Moscow. No. 9, September 1974, p. 10.
Sotsialisticheskaya industriya (Socialist Industry), Moscow. Oct. 31, 1974, p. 2.
[91] Kazakhstanskaya pravda, Alma-Ata. July 23, 1974, p. 2.
[92] Ekonomicheskaya gazeta (Economics Gazette), Moscow. No. 44, October 1974, p. 2.
[93] Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Geologiya i Razvedka (Transactions of the Universities, Geology and Exploration Ser.), Moscow. No. 12, December 1974, p. 171.
[94] Work cited in footnote 51.

plex at the lower reaches of the Angara River in Krasnoyarsk Kray began in 1974. The first samples of the ore were sent to Kemerovo and Kazakhstan for a recovery process to be developed.

**Magnesium.**—Five magnesium plants with an estimated combined yearly capacity of 67,000 tons produced an estimated 60,000 tons, over 5% more than in 1973. Exports of metal increased from 14,800 tons in 1971 to 27,900 tons in 1974.

**Manganese.**—The Soviet manganese industry is the largest in the world with marketable ore output at 8.3 million tons, or 1% over that of 1973. Three-quarters of the total came from the Nikopol' Basin in the Ukraine, and the rest from the Criatura Basin in Georgia. Some 300,000 tons of crude ore were produced in the Urals. Exports of manganese ore increased from 1.3 million tons in 1973 to 1.5 million tons in 1974.

Facilities with an annual output of 250,000 tons of crude ore were commissioned at the Chiatura Basin in 1974, while completion of the first stage of a concentrator at Darkveti in this basin was rescheduled for 1975. A manganese complex with an annual capacity of 1 million tons of crude ore is under construction at the Nikopol' Basin. Hitherto, basically soft oxide ore was mined by underground methods in the Nikopol' Basin but the expansion necessitates the mining of rather hard carbonite ores; the known carbonite reserves are about half of the total.

**Mercury.**—Mercury output was estimated at 54,000 flasks (76 pounds) and the U.S.S.R. was apparently self-sufficient in 1974. Exports of mercury to Western countries are expected to start in 1975–76. The Khadarkan complex in Kirgizia continues to be the largest mercury operation. Production at the Nikitovskiy complex in the Ukraine, the second major producer, has risen steeply, but the shortage of proved reserves limits its expansion.[95] The Teming-Khainskoye mercury enterprise in Tuva, A.S.S.R., increased its production in 1974.

Construction continued on the Dzidzikrutskiy (Aznob) Mercury-antimony complex in Tadzhik S.S.R., and was scheduled for completion in 1975. Construction of a new mercury complex at Zapadnaya Polyana, 130 kilometers from Pevek in Chukotka began in 1974. Small cinnabar deposits have been found in the Transcarpathian Oblast', Ukraine.

**Molybdenum.**—The metal content of molybdenum concentrates was estimated at 8,800 tons, about 4% above that of 1973. About 50% came from copper-molybdenum ores in Armenia, Kazakhstan, Sorskoye, and other deposits in Siberia; over 30% was molybdenite ores mines in Uzbekistan and in Siberia; the remainder came from tungsten-molybdenum ores of Tyrny-Auz (Kabardin A.S.S.R. in North Caucases) and Dzhida (Buryat A.S.S.R.). Soviet reserves of molybdenum in ore may approach 200,000 tons.

Armenia is the major producer of concentrates, which are shipped out of the republic for further processing. The Kadzharan copper molybdenum complex in Armenia supplied about 25% of Soviet molybdenum in 1974. Output of molybdenum concentrates in 1975 at this complex is to be increased by 20% above the 1970 level. Production of molybdenum concentrate was increased at the Balkhash complex in Kazakhstan and at the Almalyk complex in Uzbekistan. The Tyrny-Auz complex, one of the largest Soviet molybdenum operations, which is also being expanded, had one underground mine, two open pits (one under development), and a concentrator in operation in 1974. Renovation of the 25-year-old Sorskiy molybdenum complex in Khakas Autonomus Oblast' was in progress in 1974. Reportedly, a deposit of molybdenum ore was discovered near the Sayan Mountains in Krasnoyarskiy Kray in 1974.

**Nickel.**—The U.S.S.R. retained its position as the world's second largest producer of nickel, with an estimated 145,000 tons of smelter products, 7.4% more than in 1973. The 1974 plan called for a 13.7% expansion, but because of low recoveries and slow development of richer deposits at Norilsk the planned quota was not met. Sulfide ores are mined at Norilsk in West Siberia and in the Pechenga-Monchegorsk area in the Kola Peninsula. Oxide ores are produced in the Aktynbinsk area of the Southern Urals, the Ufaley area of the central Urals and the Ukraine. The centers of production in order of importance continue to be Norilsk, Urals, and the Kola Peninsula. Of the seven smelters in operation, Norilsk is the most important; Ufaley, Rezh, and Khalilovo smelters in the Urals are a close second. The Mon-

[95] Work cited in footnote 68.

chegorsk and Pechenga smelters are third, and the Pobuzhsk ferronickel plant in the Ukraine is fourth. Production is estimated at a probable 155,000 tons in 1975 and 200,000 tons in 1980. In the future the Soviet Union will be an important nickel exporter, based on both Soviet and Cuban concentrates.

The Norilsk complex in West Siberia is producing copper, nickel, cobalt, platinum-group metals, selenium, and other rare metals, and recent expansion has been rapid. In 1973 the production of nickel increased 31% over that of 1972, and during 1974 Norilsk had to expand nickel output 87.7% over that of 1970. In 1973, the leading Talnakh's "Mayak" mine achieved its planned capacity, and the fourth stage of the larger "Komsomol'skiy" mine was commissioned. In 1974, new facilities were put onstream at the "Komsomol'skiy" mine and development was nearing completion on the Oktyabr'skiy mine.

The first stage of the Oktyabr'skiy mine at Norilsk was completed in August and the second stage in December 1974. The mine operates a depth of about 1,000 meters, and full planned capacity is to be reached in four stages by 1980. The Oktyabr'skiy mine is the largest underground mine in the Soviet nonferrous industry. The Mayak, Komsomol'skiy, Oktyabr'skiy, and other (old) enterprises at Norilsk were in operation in 1974. The Taymyr mine (1,000 to 1,500 meters deep), the fourth underground mine at the Talnakh and Oktyabr'skiy deposits, was under development in 1974.

Recovery of nickel in concentrate increased by 7.2% in 1966–70. During the 1971–74 period a further increase in nickel recovery from ores was achieved. Nevertheless, losses continued to be high. For example, losses during recovery of nickel from 1.5% nickel content ore at the Rezhsk nickel plant were up to 20% in 1974.[96]

Because of preventive maintenance repair violations at the Pobuzhsk ferronickel plant, which was put into operation in 1973, there were major breakdowns.[97] Reportedly, a deposit of copper-nickel ore was discovered near Zapolarnyy in Murmansk Oblast' in 1974. Twenty teams of geologists were engaged in searching for copper-nickel ore at Norilsk region in 1974.[98]

The U.S.S.R. is financing a $600 million expansion of Cuban nickel production, with output of 90,000 tons per year, scheduled for 1985. The Gipronickel Institute in Leningrad is designing a new plant to be built in Oriente Province to recover nickel and cobalt. A short-term program is underway to increase the capacity of the 36,000-ton-per-year Punta Gorda nickel complex with the assistance of Soviet and Czech engineers.

The Soviet Union has been negotiating an agreement with Finnish, West German, and Japanese companies to supply equipment for a nickel smelting plant, which is to be built in the Kola Peninsula region. The raw material for this plant will partially be shipped from Norilsk.

**Platinum.**—The Soviet Union remains the largest producer and exporter of platinum–group metals, supplying 20% to 25% of international exports of platinum and more than 50% of world consumption of palladium and rhodium. Reserves are adequate to maintain current production for many years, with increased exports. The U.S.S.R. is steadily expanding its output of platinum–group metals; the estimated output was 2.5 million ounces in 1974. Production of platinum and platinum–group metals may reach 2.65 million ounces by 1975 and 3.2 million ounces by 1980.

Production of platinum and platinum–group metals came principally from the Norilsk complex in West Siberia, the Severonikel and Pechenganikel complexes on the Kola Peninsula, and several placer deposits in the Urals. Virtually all platinum–group metals were produced as byproducts, with about 75% coming from Norilsk. The high priority given to the Norilsk development suggests that the Soviets are determined to proceed with increased production of platinum and platinum–group metals despite high costs imposed by the harsh northern climate. Expansion is expected to accelerate in a few years, with completion of the Oktyabr'skiy mine at this complex. This mine has been under development since 1969. The Oktyabr'skiy mine is the third mine to be put into operation at the Norilsk complex since the discovery of new and rich deposits; the development program began in 1961.

**Silver.**—Output of silver was estimated

[96] Pravda, Moscow. February 26, 1974, p. 2.
[97] Work cited in footnote 51.
[98] Sotsialisticheskaya industriya (Socialist Industry), Moscow. May 21, 1974, p. 2.

at 42 million troy ounces, 2.4% above that of 1973. Almost all silver is produced as a byproduct from nonferrous operations, with production mainly centered in the Soviet Far East, East Siberia, the Urals, Kazakhstan, and Armenia. During the year 14 gold treatment plants extracted silver, and the Norilsk complex in West Siberia and some of the Kola copper-nickel enterprises also produced silver. The Zarafshan gold plant in Uzbenistan began production of silver in 1974.

**Tin.**—Although the Soviet tin production policy is based on self-sufficiency at any price, output continues to be inadequate and about 15% of requirements had to be imported in 1974. Tin production in 1974 was estimated at 29,500 long tons, 1.7% over that of 1973. The Soviet Far East, Yakutia, and Transbaykal were the main tin producers. In 1974, over 25% of total output was from placers, and the Soviet northeast placers accounted for 75% of production.

The Dal'olovo (Far East Tin) concern in Primorskiy Kray was closed in 1974, and all its operations were transferred to the Khrustal'nyy complex in the same Kray. As a result, the Khrustal'nyy mine operated the Khrustalnoye, Silinskoye, Verkhneye, and Levitskoye deposits in 1974. The Arsen'evskaya mine of the Khrustal'nyy complex is under development and scheduled for completion in 1975. Development of the Pridorozhnyy mine, operated by the Solnechnyy complex in Khabarovsk Kray, was completed in 1974. This is the second mine (the other is Molodezhnyy) at this complex. The Solnechnyy and Pereval'skiy mines at the Khrustal'nyy complex were under development in 1974.

Production at the new Muza section of the Omsukchan mining and concentrating complex in Magadan Oblast' began in 1974. The Badzhal deposit was discovered in the Amgun River Basin through which the Baykal-Amur railway is to be built.

Three known refineries were operating in the U.S.S.R. in 1974: The Novosibirsk, Ryazan', and Podol'sk (near Moscow). The Nonsibirsk central smelter, the largest in the country, was short of 2.6 million rubles of working capital in 1974.

**Titanium.**—Development of the titanium industry continues with an estimated production of 28,000 tons of titanium metal, the U.S.S.R. was the world's second largest producer in 1974. Large amounts of titanium sponge are now sold to the West. During 1971–75, a 40% expansion is expected and exports will increase significantly. The industry continued to be based mainly on Ukranian and Siberian ilmenite and rutile. Reports indicated that a titaniferrous slag containing 83% titanium dioxide is being produced at the Zaporozhye plant.

Renovation of the Irshanskiy mining and concentration complex in Zhitomirskaya Oblast' was completed during 1971–74, and the complex met the 1974 quota ahead of schedule. Output of zircon, rutile, and ilmenite concentrates from Samotkanskoye placer increased in 1974. The Ust'-Kamenogorsk titanium and magnesium complex almost attained the production level planned for 1975.

**Tungsten.**—Estimated production of 7,000 tons of tungsten in concentrate was insufficient for growing domestic needs, and about 33% of requirements had to be imported. The industry continues to be centered mainly in the North Caucasus, Transbaykal, the Soviet Far East, Central Asia, and Kazakhstan.

Development of the second open pit at the Tyrny-Auz tungsten-molybdenum complex in North Caucasus continued in 1974. Exploration of a new tungsten deposit in Buryat A.S.S.R., which will increase production at the Dzhida tungsten-molybdenum complex, continued in 1974.

**Vanadium.**—The Soviet Union, with large vanadium resources, is becoming an important producer and exporter. The principal sources in 1974 continued to be vanadium-rich slag, a coproduct with iron from the titaniferrous magnetites of the Kachkanar open pits in the Urals and the iron ore of Lisakovskiy deposit in Kazakhstan. However, the metallurgical problems of vanadium recovery have not yet been satisfactorily resolved. The Nizhniy Tagil metallurgical complex is the only modern enterprise in the U.S.S.R. that produces raw material and its alloys. A new plant for ferrovanadium production from Urals magnetite ores continued to be under construction at the Serov steel plant. The third section of the first stage of the Lisakovskiy complex was completed in 1974.

**Minor Metals.**—The Soviet Union possesses commercial deposits of all those rare metals that have assumed importance in

modern rocketry, aircraft, and nuclear energy. The main deposits are in Kazakhstan, Kola Peninsula, Armenia, Urals, Ukraine, Norilsk, Transbaynal, and Soviet Far East. Experimental extraction of gallium from wastes at the Pavlodar alumina plant began in 1974. Production of indium, selenium, thallium, and tellurium as a byproduct of copper and zinc operations at the Bashkirian nonferrous industry began in February 1974, and commercial production of indium at the Almalyx complex in Uzbekistan began in May 1974. Production of scandium, as byproduct of the Ust'-Kemanorgorsk titanium and magnesium complex in Kazakhstan, began in May 1974. Output of silicon in the Ukraine attained the production level of 1975.

## NONMETALS

The Soviet Union produced a wide variety of nonmetallic minerals. However, the resource position varies from a adequacy for many nonmetallic minerals to apparent shortages of others such as barite, fluorspar, mica and talc.

**Asbestos.**—In 1974, the U.S.S.R. produced an estimated 1.36 million tons of six grades of asbestos, 80,000 tons more than in 1973, and was second only to Canada. Canadian equipment is being used in large-scale expansion of the industry. Exports increased from 385,300 tons in 1970 to 448,900 tons in 1973 and to 528,000 tons in 1974. Despite export expansion in recent years, with about half going to Western market, the domestic asbestos deficit was 200,000 tons in 1971 and is expected to be about 100,000 tons in 1975.[99]

The 1971–75 5-year plan foresees a rise in production of 563,000 tons by increasing output at Dzhetygara from 259,000 tons in 1970 to 360,000 tons in 1975, by expansion of the plant No. 6 in the Urals from 320,000 to 550,000 tons, and by increasing output at other facilities in the Urals and at the Tuvaasbest combine. Estimated output for 1975 and 1980 is 1.45 million tons and 1.7 million tons, respectively.

Development is centered in the Urals, Kazakhstan, and Tuva A.S.S.R. Output of chrysotile asbestos at the Ural-asbest combine was estimated at 930,000 tons; in Kazakhstan, the Dzhetygara No. 1 mill produced 340,000 tons and the No. 2 mill, 60,000 tons. The first section of the Dzhetygara No. 2 mill, with a 100,000-ton annual capacity was completed in February 1974, and the second stage with the same capacity was commissioned in December 1974.

In 1974 the Tuvasbest combine at Ak-Dovurak in Tuva A.S.S.R. produced an estimated 35,000 tons of the highest quality and the greatest fiber length of any known Soviet asbestos reserves. For some time anthophyllite and other nonchrysotile varities of asbestos have been mined at a small Sysersk deposit in the Urals and at the Bugetyysk deposit in the Mugadzhary Hills, Kazakhstan.

Development of the Kiembay deposit in Orenberg Oblast' (Southern Urals), which started in 1968, continued in 1974. Under an agreement signed in June 1973, seven COMECON members are to assist in completion of this project. The design capacity of the complex is 500,000 tons per year of grades III to VI from 24 million tons of ore with an average grade of 4.4%. The complex is to be built in two equal stages. Reserves at the Kiembay deposit are estimated at 20 million tons. The open pit will be 2.2 kilometers long, 1.8 kilometers wide, and 150 meters deep. The first stage is to be completed in 1979 and its output will be shared among the COMECON members in proportion to their contribution to the construction. The design of the Molodezhnyy asbestos mining and concentrating complex in Buryat A.S.S.R. was completed in 1974.

**Barite.**—Barite is mined by both open pit and underground methods, and at some operations crude output is concentrated by flotation. About two-thirds of the country's barite consumption in 1974 was produced domestically; the balance is being filled by imports of high-grade barite mainly from North Korea, Bulgaria, Yugoslavia, and Romania. The main center of production continued to be Georgia, which produced over two-thirds of the total output in 1974. Some deposits have been developed in Kazakhstan, West Siberia, the Urals, Azerbaydzhan, and Armenia. The increase in output in 1974 was attributed largely to the increasing byproduct output at the Achisay polymetallic complex in Kazakhstan. Construction of a 45,000-ton-per-year complex at Khaishi in Svanetia,

[99] Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 12, December 1971, p. 89.

Georgia, and development of the Zharemsk underground mine and open pit in Kazakhstan continued in 1974.

**Cement.**—Approximately 110 plants produced 115.1 million tons of cement, or 4.5% more than in 1973. Plans called for the construction of 5.8 million tons of new capacity in 1974, but 5.6 million tons of the total was completed. The planned construction costs of a cement plant with a yearly capacity of 0.6 million tons was over 20 million rubles. As a result of poor-quality cement and inefficient transportation and use of cement, 21% to 22% of the total production was wasted in 1974.[1] Losses of cement in the producing plants totaled 5% to 6% of gross output; in loading, unloading, and transporting, 10%; and in utilization by concrete and mixing plants, 6%. With a total cement production of 115 million tons in 1974, these losses would mean an effective reduction in available supply of 25 million tons.

Plans call for production of 122 million tons of cement and for construction of 4.3 million tons of new capacity in 1975.

**Diamond.**—The U.S.S.R. continued to make rapid progress in expanding its diamond industry, which is centered in Yakutia where about 20 deposits have been discovered. Production in this region started at a small plant in 1957. In January 1974, the industry consisted of the large Mirnyy open pit with five concentrators, the Aykhal open pit and concentrator, the Udachnaya placer mine and concentrator (near the Arctic Circle), and the Irelyakh placer mine with two dredges. Small quantities of gem and industrial stones were produced from the Vishera River region placers in Perm'Oblast', western Urals. In 1974, output was estimated at 7.6 million carats of industrial quality and some 1.9 million carats of gem quality. The diamond industry remains a major foreign exchange earner with receipts of some 300 million rubles in 1974.

Gem stones are cut with the assistance of Belgian specialists at Leningrad, Sverdlovsk, and Smolensk. The U.S.S.R. has arranged to market its diamond output in Antwerp through a newly formed Soviet-Belgian company in which Almazyuvelirexport has the controlling interest.

**Fertilizer Materials.**—Production totaled 19.3 million tons in nutrient content, or 80.3 million tons in bulk fertilizer content,[2] an increase of 11% over that of 1973. Nitrogen fertilizers constituted around 41%; potassium fertilizers, 34%; phosphate fertilizers, 18%; and phosphatic flour, 7%. The Soviet mineral fertilizers industry met production goals for 1974. This increase was obtained mainly through the commissioning of new capacities. In 1974, capacity at plants was expanded by 7 million tons of fertilizers (Soviet standard) per year, including facilities at the Novomoskovskiy, Severodonetskiy (the third Kellog-designed, 1,500-ton-per-day ammonia plant), and Voskresenskiy chemical complexes as well as at the Gomel'skiy and Kuybyshevskiy chemical plants. The planned quota for construction of new facilities was met by 68% in 1974.

There was an increase in exports of potassium salts and phosphorus and nitrogen fertilizers. Despite substantial production and large exports, fertilizers did not meet domestic demand. A high percentage of superphosphate and potassium fertilizers was not granulated and great difficulties were experienced in commissioning some new projects and attaining planned capacity of facilities.[3]

Over 97% of the fertilizers were shipped by railroad, mostly in bulk, causing loading losses, moisture penetration, and difficulties in loading and unloading. Unloading took place at almost 7,000 railroad stations with the use of manual labor. As a result, about 10 million tons (15% of the total shipped) of fertilizers was lost in 1974.[4]

An agreement between the Soviet Union and certain COMECON countries has been signed for the construction of the Kingisepp mineral fertilizer plant in Leningrad Oblast'. The East European countries will supply the equipment for this plant in exchange for Soviet deliveries of ammonium phosphate over a period of 10 years, beginning in 1976.

The U.S.S.R. is cooperating with France, the United States, West Germany, and other Western countries in the pro-

[1] Material'no-tekhnicheskoye snabzheniye (Material-Technical Supply), Moscow. No. 6, 1973, pp. 3–8.
Shakhtnoye stroitel'stvo (Shaft Construction), Moscow. No. 9, 1973, pp. 5–6.

[2] The average content (nitrogen, phosphorus, and potash) is expressed in Soviet standard units. Nitrogen is expressed as ammonium sulfate, 20.5% N, phosphate is expressed as 18.6% $P_2O_5$, potash is expressed as 41.6% $K_2O$, and ground rock phosphate (phosphatic flour) is expressed as 19% $P_2O_5$.

[3] Ekonomicheskaya gazeta (Economic Gazette). Moscow. No. 9, February 1975, p. 2.

[4] Material'no-tekhnicheskoye snabzheniye (Material-Technical Supply), Moscow. No. 8, August 1974, pp. 8–12.

duction of chemical products. The construction of an ammonia complex with an annual capacity of 1.8 million tons began in 1974 near Kuybeshev. Chemical Construction Co. of the United States will supply engineering and equipment for four 1,360-ton-per-day ammonia plants to be operating by the end of 1978 under a $200 million contract with the U.S.S.R. Natural gas from the nearby Orenburg Field will serve feedstock. A 1,500-ton-per-day urea plant will be constructed in the U.S.S.R. by the Italian company Montedison. French Creusot-Lori Enterprises will construct a 1.8 million-ton-per-year ammonia plant at Gorolvka in the Donets Basin, Ukraine, and at Kemerovo in West Siberia. Each complex comprises a two-line plant, each line with a capacity of 1,360 tons per day. Toyo Engineering Co. Ltd. and Mitsui Group have exported 12 ammonia plants and 1 urea plant to the Soviet Union and have received inquiries for 8 more large ammonia plants. At the same time, the Soviet Union will aid Morocco's phosphate industry under a long-term technical cooperation agreement signed in March 1974.

The growth of the Soviet mineral fertilizer industry is on the priorities list of Soviet planners. The 1975 plan envisages output of 90 million tons in bulk (22.2 million tons of nutrients), with 72 million tons being supplied to agriculture, and a 13.7 million-tons-per-year construction of new mineral fertilizer facilities. Estimated production for 1975 and 1980 is 90 million tons (Soviet standard) and 125 million tons, respectively.

*Nitrogen.*—Nitrogen production was expanded from 35.3 million tons (20.5% N) in 1973 to 38.3 million tons in 1974, 3.0 million tons more than 1973 production. The bulk of the production was in the form of ammonium sulfate and ammonium nitrate fertilizers, although production of urea and liquid fertilizers has increased. Estimated levels of nitrogen production for 1975 and 1980 are 42 million tons (20.5% N) and 56 million tons, respectively.

*Phosphate.*—Increased output of phosphate fertilizers in 1974 was attained largely through the commissioning of new capacity rather than through greater use of available facilities. Single superphosphate continued to be basic type of material produced.

The Soviet Union possesses two of the world's greatest reserves of phosphate rock, the apatite-nepheline ores in the Kola Peninsula and phosphorites in the Karatau area in southern Kazakhstan. The apatite concentrate with 39.4% $P_2O_5$ provided about 75% of all raw materials for the production of phosphate fertilizers; the balance was produced from Karatau phosphorites. Deposits of phosphorites also occur in Upper Kama, the Moscow District, Kingisepp in Leningradskaya Oblast', Bryansk, and some other regions, but the $P_2O_5$ content is rather low. Generally they produce phosphorite flour with about 19% $P_2O_5$.

Minable reserves of phosphate were estimated in 1974 at about 2,700 million tons of phosphate rock (overall average grade 13.8% $P_2O_5$), including some 250 million tons of proved reserves and 2,917 million tons of apatite (average grade about 18% $P_2O_5$), including around 500 million tons of proved reserves.

Estimated output of phosphate rock was 57.6 million tons in 1974, including 35.6 million tons of apatite (17.7% $P_2O_5$) and 22 million tons of sedimentaries (13% $P_2O_5$). The main centers of phosphate rock production continued to be the "Apatit" complex on the Kola Peninsula, and phosphorite deposits at Karatau in Kazakhstan, Kingisepp in Leningrad Oblast', Egor-evsk and Lopatino (Voskresensk complex) in Moscow Oblast', Upper Kama in the Urals, and Kolpino in Bryansk Oblast'.

The Khibiny apatite-nepheline deposit is the largest single phosphate source. Mined ore, averaging 17% to 18% $P_2O_5$ was concentrated up to 39.4% $P_2O_5$ with 92% recovery. The apatite complex produced 15.3 million tons of concentrate (35.6 million tons of ore) in 1974 from three underground mines and one open pit and two concentrators. The complex employed over 16,000 workers in 1974. New facilities with a yearly capacity of 1.7 million tons of apatite ore were commissioned at the Tsentral'nyy open pit in 1974. Production of apatite ore began at the mall Saamsk open pit in November.

Construction of the experimental mill at the Zabaykal'skiy complex in Buryat A.S.S.R. started in 1974. Between 1976 and 1980 this will begin experimental production of an apatite concentrate from the Oshurkovo deposit where reserves are large, but have only a 4% $P_2O_5$ content. In the future, the commercial Zabaykal'-

skiy apatite complex, with an annual capacity of 1.3 million to 1.5 million tons of concentrate is to be built. At the Kovdor iron ore and concentrating complex on the Kola Peninsula an apatite concentrate plant with a first stage capacity of 880,000 tons was commissioned in December 1974.

The 40 commercial deposits in the Karatau area of Kazakhstan contain 1,700 million tons of phosphorite. Less than half of the reserves of the basin can be extracted by open pit methods. Seven open pits at the Akcay and Dzhanytas deposits and the Molodezhnyy underground mine at the Chulaktan deposit have a total capacity of around 7.5 million tons and were operating in 1974. About 70% of total production in Karatau came from the Dzhanytas deposit. The ore, containing up to 26% $P_2O_5$, was upgraded to 28.5% $P_2O_5$ but recovery is low. Because of equipment shortages, Dzhanytas open pits produced 7 million tons of ore below the planned capacity in 1974.[5]

The Voskresensk complex in Moscow Oblast' produced over 2 million tons of phosphate flour in 1974. The first stage for the production of monoammonium phosphate at the Kingisepp phosphorite complex in Leningradskaya Oblast' was commissioned in 1974. The second stage was under construction and is scheduled for completion in 1975.

Reserves of apatite ore at the Beloziminsk deposit in Irkutusk Oblast' in categories $C_1$, plus $C_2$ (possible reserves) with 6.4% to 11.7% $P_2O_5$ content were approved by the GKZ. (State Commission for Reserves) in 1974. Reportedly, the Siliktarskiy apatite deposit was discovered in southern Yakutia in 1974.

*Potassium.*—The Soviet Union is one of the world's leading countries in potassium ore reserves, fertilizer output, and exports of potash salts. Gross potash reserves are reported at 22,900 million tons of 16% to 40% $K_2O$ content (3,800 million tons of $K_2O$). About two-thirds of the reserves are located at the Upper Kama Basin in the north Urals. Estimated 1974 potash output was 15 million tons (41.6% $K_2O$) over 3% higher than in 1973. The four major producers are Solikamsk and Berezniki on the western side of the Urals, Soligorsk in Belorussia and Stebnikov, and Kalush in West Ukraine. Eight combines were in operation in 1974.

Under the 1971–75 5-year plan, potash output is to increase from 9.8 million tons (41.6% $K_2O$) in 1970 to 19.8 million tons in 1975. The Uralkaliy (Ural potash) concern is to increase production of potash salts from 3.8 million to 10.8 million tons; the Belaruskaliy concern is to increase production of potassium chloride from 4.8 million to 8 million tons per year, and the Kalush chemical-metallurgical complex is to increase the output of fertilizers from 382,000 tons in 1970 to 500,000 tons (41.6% $K_2O$) in 1975. Estimated levels of potash output for 1975 and 1980 are 17 million tons (41.6% $K_2O$) and 23 million tons, respectively.

In 1974, the Belaruskaliy concern produced an estimated 7.6 million tons (41.6% $K_2O$) from about 28.7 million tons of ore with a recovery of 80%. Construction of the Soligorsk No. 4 potassium complex in Belorussia began in 1974. The second stage of the Berezhiki No. 3 potassium complex in the Urals, with an annual capacity of 1.8 million tons, was completed in December. The total yearly capacity of the Berezniki No. 3 complex is 3.6 million tons (41.6% $K_2O$). The Berezniki No. 4 potassium complex and the new facilities at the Solikamsk mining operations in the Urals were under construction in 1974.

A 5-year cooperative agreement between the U.S.S.R. and East Germany on the development of automated process control for potash mines and plants was signed in November 1974. Reportedly, several deposits of potassium have been discovered in the southeast of Turkmenia.

**Fluorspar.**—Fluorspar output remained below domestic requirements despite efforts to achieve self-sufficiency. Imports of fluorspar from Mongolia, PRC, Thailand, and Japan increased from 144,700 tons in 1970 to 487,400 tons in 1974. Estimated levels of fluorspar output for 1975 and 1980 are 475,000 tons and 540,000 tons, respectively.

Fluorspar is mined in Maritime Kray (Voznesensk deposit), Chita Oblast' (Kalanguyev, Abagaytuysk, Solnechnyy, and Usulinsk deposits), Buryat A.S.S.R., Central Asia, and other regions. The first section of a new facility at the Yaroslavskiy complex in the Maritime Kray

[5] Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 9, September 1974, pp. 31–33.

was commissioned in 1974 at a cost of 1.2 million rubles. At the concentrator three mills were installed, flotation machines were replaced, and other extensive renovation was carried out. The new unit is to process 345,000 tons of ore per year.

**Mica.**—The domestic supply of mica was augmented by large imports, despite the increasing use of substitutes. Strategic-grade mica continued to be imported from India to meet special industrial demands. Imports of mica increased from 160 tons in 1968 to 725 tons in 1974. Estimated output of mica totaled 41,000 tons in 1974.

Irkutsk Oblast' continued to be the main supplier of muskovite. Nine mines were in operation in 1974. Mica is also mined at the Aldanslyuda (Aldan mica) combine in Yakutia and at the Karelslyuda (Karelia mica) and Kovdorsly (Kovdor mica) combines in the Karelo-Murmansk region.

**Salt.**—The Soviet Union is one of the world's leading countries for salt reserves, production, and exports. Production in 1974 was estimated at 12.5 million tons. Output of salt may reach 13 million tons by 1975, expecting to rise to 16 million tons in 1980. Exports increased from 279,700 tons in 1973 to 346,300 tons in 1974. Salt development is concentrated in the Donets Basin, the Urals, East Siberia, Armenia, West Ukraine, and other areas. The Donets Basin continued to account for over 40% of total output in 1974. The increase in production came mainly from the Iletsk mine in Orenburg Oblast' and the Avansk mine in Armenia.

The Nizhniy Baskunchak salt complex, with an annual capacity of 700,000 to 900,000 tons, was under construction in 1974. The construction of the Verkhnekamsk salt complex in Permskaya Oblast' and renovation of the Iletsk mine continued in 1974. The Avansk mine and a new mine with an annual capacity of 60,000 tons are under development and scheduled for completion in 1975. Construction of the Mosyr salt complex in Belorussia, based on rock salt deposits which lie at depths of up to 700 meters began in 1974. The planned capacity of the complex is 360,000 tons per year. It is planned to develop the Berezniki and Solikamsk potassium complexes in the Urals during the 1976–80 period. The U.S.S.R. has awarded a contract to Tecnimont for the engineering of the 270,000-ton-per-year Sterlitamak salt plant in Bashkiria. The plant will be based on Montedison technology and is due to startup in 1976.

**Sulfur.**—The U.S.S.R. has large reserves of sulfur, but grades are low and costs high. Estimated production of contained sulfur totaled 8 million tons, of which 3.6 million tons was recovered from pyrite, 2.4 million tons from native sulfur, and 2 million tons from other elemental sulfur. Estimated levels of total sulfur output for 1975 and 1980 are 8.4 million and 10 million tons, respectively. The principal producers of native sulfur continue to be Rozdol (West Ukraine) and Gaurdak in Central Asia, which together produced the bulk of the country's requirements. Exports of sulfur decreased from 440,300 tons in 1973 to 439,600 tons in 1974. Imports increased from 468,300 tons in 1973 to 471,800 tons in 1974.

The Northern open pit of the Gaurdak complex in Turkmenia produced 1.5 million tons of ore in 1974. This new open pit, with a yearly capacity of 600,000 tons of ore, was under development in 1974. The Yavorovskiy mine in L'von Oblast' produced 150,000 tons of sulfur from 23 wells, using the Frasch process. The first stage of this mine, with a yearly capacity of 300,000 tons, is scheduled for completion in 1975. The second stage, with the same capacity, will also be constructed in 1975.

**Talc.**—The U.S.S.R. produced an estimated 410,000 tons of talc in 1974, 2.5% more than that of 1973. In 1974, only the Onot deposit in Irkutsk Oblast', with a yearly capacity of 45,000 tons of talc, produced high-grade material. Despite large reserves and the development of new mines and beneficiation facilities, imports of talc increased from 44,900 tons in 1973 to 72,700 tons in 1974. Estimated levels of talc output for 1975 and 1980 are 420,000 and 500,000 tons, respectively.

The Miass and Shabrovsk deposits in the Urals and the Kirgiteysk deposit in Krasnoyarskiy Kray were the major Soviet producers of low-quality talc in 1974. Some talc ore was mined from the Southern Osetinsk and other small deposits. The raw material at the Onotsk deposit is shipped for processing to the Miass talc mill in the Urals. The Alguyskoye talc deposit has been explored and it is planned to develop this deposit in the future.

## MINERAL FUELS

Production of primary energy derived from fossil fuels, fuelwood, and hydroelectric and nuclear generation increased from 1,437 million tons in standard fuel equivalent in 1973 to an estimated 1,527 million tons in 1974. The share of petroleum and natural gas in the total Soviet primary energy production increased from 62.3% in 1973 to 63.8% in 1974, while that of coal (anthracite, bituminous, and lignite) declined from 32.6% to 31.4%, respectively. The output of primary energy (from all sources) in the U.S.S.R. in 1975 is placed at 1,625 million tons of standard fuel. By 1980, Soviet primary energy production (from all sources) is to rise to 2,000 million tons. Soviet energy production will get high investment priority during the 1976–80 plan period.

Total consumption of all types of primary energy in the Soviet Union increased from 1,276 million tons of standard fuel equivalent in 1973 to an estimated 1,346 million tons in 1974. The share of petroleum and natural gas in total Soviet primary energy consumption increased from 59.1% in 1973 to an estimated 60.2% in 1974, while that of coal declined from 35.3% to 34.3%, respectively. Total consumption of all types of primary energy in the U.S.S.R. is to be equivalent to 1,420 million tons of standard fuel in 1975 and to over 1,700 million tons in 1980.

In 1974, the U.S.S.R. produced 459 million tons of crude oil and gas condensate, 684 million tons of run-of-mine coal and lignite (including 175 million tons of raw coking coal), and 261 billion cubic meters of natural gas. Increases of 7% for oil and gas condensate, 10% for gas, and 3% for coal were recorded over 1973 production.

Despite expansion of Soviet primary energy production and exports during recent years, the fuel and energy supply in the U.S.S.R. has not kept up with demands of the Soviet economy, which has experienced chronic energy shortages, particularly in the European part of the U.S.S.R. The Soviet economy sustains immense losses each year as a result of inefficient output and underutilization of energy.

The Soviet Union's reported energy consumption per capita approaches that of Western Europe, although there is still a significant difference in the standard of living. One reason for the apparent difference is that the Soviet growth is measured in terms of energy "produced," not in terms of energy usefully consumed. In addition, fuel shortages often bring with them the production of substandard fuels, which are often marketed as standard quality fuels.

The primary energy balance of the U.S.S.R. for 1973 and 1974 is shown in table 6.

**Table 6.—U.S.S.R.: Total primary energy balance for 1973 and 1974**
(Million tons of standard fuel equivalent)

| Year | Total primary energy | Coal (lignite anthracite, bituminous) and coke) | Crude oil and petroleum products | Natural and associated gas | Peat | Oil shale | Fuelwood | Hydropower | Nuclear power |
|---|---|---|---|---|---|---|---|---|---|
| 1973: [1] | | | | | | | | | |
| Production | 1,436.6 | 468.4 | 613.5 | 282.4 | 20.2 | 10.6 | 25.1 | 15.0 | 1.4 |
| Imports | 44.0 | 9.3 | 21.0 | 13.7 | -- | -- | -- | -- | -- |
| Exports | 204.2 | 25.8 | 169.0 | 8.2 | -- | -- | -- | 1.2 | -- |
| Apparent consumption | 1,276.4 | 451.9 | 465.5 | 287.9 | 20.2 | 10.6 | 25.1 | 13.8 | 1.4 |
| 1974: [2] | | | | | | | | | |
| Production | 1,526.6 | 480.0 | 657.0 | 314.0 | 20.2 | 10.9 | 25.1 | 17.5 | 1.9 |
| Imports | 31.0 | 9.0 | 7.7 | 14.3 | -- | -- | -- | -- | -- |
| Exports | 211.7 | 27.6 | 166.0 | 16.8 | -- | -- | -- | 1.3 | -- |
| Apparent consumption | 1,345.9 | 461.4 | 498.7 | 311.5 | 20.2 | 10.9 | 25.1 | 16.2 | 1.9 |

[1] Production data for 1973 taken from the National Economy of the U.S.S.R. (Moscow), 1974; trade data from Foreign Trade of the U.S.S.R. (Moscow), 1975.
[2] Production data reported in Pravda (Moscow), January 25, 1975, and in other Soviet sources; trade data from Foreign Trade of the U.S.S.R. (Moscow), 1975.

Production of primary energy by source for 1940, 1960, and 1975 is shown in the following tabulation:

| Source | Actual | | | | Planned | |
|---|---|---|---|---|---|---|
| | 1940 | | 1960 | | 1975 | |
| | Million tons of standard fuel | Percent | Million tons of standard fuel | Percent | Million tons of standard fuel | Percent |
| Petroleum | 44.5 | 18.5 | 211.4 | 29.9 | 701.1 | 43.0 |
| Natural gas | 4.4 | 1.8 | 54.8 | 7.8 | 339.6 | 20.8 |
| Coal | 140.5 | 58.3 | 368.6 | 52.1 | 489.8 | 30.0 |
| Hydroelectric power | 3.3 | 1.4 | 27.2 | 3.8 | 47.8 | 2.9 |
| Nuclear power | -- | -- | -- | -- | 7.8 | .5 |
| Peat, oil shale and fuelwood | 48.4 | 20.0 | 45.4 | 6.4 | 45.4 | 2.8 |
| Total | 241.1 | 100.0 | 707.4 | 100.0 | 1,631.5 | 100.0 |

Source: Planovoye khozyaystvo (Planned Economy), Moscow. No. 4, April 1975, p. 26.

**Coal.**—In 1974, the U.S.S.R. produced 684 million tons of run-of-mine bituminous coal, anthracite, and lignite, the equivalent of an estimated 392 million tons of clean coal according to Western practice and experience, placing it second among world coal producers. This was 17 million tons of raw coal (or 2.4%) more than was produced in 1973. The Soviet coal industry employed about 1.2 million "production" (a Soviet term used for statistics) workers, some 0.6 million "nonproduction" workers, 64,000 university graduate engineers (of whom 87 were doctors of sciences and 1,317 were candidates of sciences), and 148,000 graduate technicians. On the average, there were 60 specialists (mainly mining engineers and geologists) with a university degree, and over 150 graduate technicians for each mine. The coal industry had 36 research and design establishments with a total staff of over 41,000 persons. The coal industry employed 770,000 women, including 109,000 at the underground mines and 10,000 at the open pits.[6]

Gross production at the Soviet Union's 10 major and numerous minor coalfields amounted to an estimated 448 million tons of bituminous coal, 76 million tons of anthracite, and 160 million tons of brown coal and lignite. About 30% (202 million tons) of the total output was surface mined. Of the total output, coking coal accounted for an estimated 175 million tons, or 1.2% more than in 1973.

The 1974 production came from about 800 underground mines with an average yearly capacity of 585,000 tons and 69 open pits with an average yearly output of 2.9 million tons of run-of-mine coal and lignite. Many mines did not meet their established production quotas and did not attain planned capacities in 1974.

In 1975, production of raw coal and lignite is to reach 700 million tons. The 1975 plan envisages a total investment of 2.5 billion rubles in the development of Soviet coal industry. Facilities for the mining of 30 million tons of raw coal and lignite per year and for the processing of 12.6 million tons of run-of-mine coal per year are to be put into operation.

The expansion of the coal industry had been achieved through increased labor and capital rather than advancing technology and by mining a proportionately large share of lower quality coals and lignites. It is estimated that in real terms 2 to 3 times more investment and labor are required to achieve a given increase in coal output in the U.S.S.R. than in other principal coal-producing countries in the West. Because of persistent coal supply deficits, the achievement of quantitative goals is stressed in published literature. Qualitative goals have been postponed so that a large part of coal output does not meet established Soviet standards of quality. The productivity of labor and equipment is below planned levels, and practically all sectors of the coal industry maintain a greater number of production personnel than called for by planned targets.[7]

The consumption of coal remains centered in the European part of the

[6] Sovetskiy shakhter (Soviet Miner), Moscow. No. 3, March 1975, p. 1.

[7] Pravda, Moscow. Jan. 26, 1974, pp. 1–3. Planovoye khozyaystvo (Planned Economy), Moscow. No. 11, November 1973, pp. 16–23.

U.S.S.R., and the bulk of the coal mined in the Eastern regions is shipped great distances to consumers in the established European industrial centers. The singularly and traditionally important position of the Donets Basin derives from its geographical location and high-grade coal. Much of the Soviet industrial expansion could have been fueled by a large output of coal in the Donets Basin, but because of low labor productivity and a shortage of labor, the Donets Basin could not supply all of the economy.

This chronic shortfall in Donets Basin coal output was the main reason for the development of coal regions in the East; it was not simply a logical movement to develop new coal regions in the East as is sometimes claimed.

During 1969–72 there was a transition from a five- and four-echelon system of management to a four- and three-echelon system. As a result, 90 trusts and 2 concerns were abolished. The number of underground coal mines of the Ministry of the Coal Industry has been reduced from 966 in 1967 to about 800 in 1973, and these were organized into 580 mine administrative units. Nevertheless, 45 small mines, with a yearly capacity of up to 100,000 tons of raw coal each, were in operation in 1974.

There are three levels of management in the coal industry of the U.S.S.R. (the National Ministry, the Concern, and the Mine) and four levels in the Ukrainian S.S.R. (the National Ministry, the Ukrainian Ministry, the Concern, and the Mine). The long-term plan envisages a transition to a two-level system of management (the National Ministry and the Coal Producing Unit) or three-level system (the National Ministry, Ukrainian Ministry, and Coal Producing Unit). Each coal producing unit will include from 13 to 56 subordinate production units (mines, pits, beneficiation plants, and transport and repair organizations). A two-level management system will operate for 26 coal-producing units, 1 oil shale-producing unit, and the Hydraulic Coal Mining Scientific Production Association and there will be a three-level management system for 16 coal-producing units and 2 coal beneficiation units located in the Ukraine.

The average working thickness of the coal seams, according to 1974 data, was 1.32 meters. The maximum depth of underground coal production reached 1,150 meters in 1974, while the average depth was about 370 meters.

The relative share of coal production coming from gently dipping seams was about 70%; that of inclined seams, 14%; and that from steep seams, 16%. The hand-loading of coal at gently inclined seams was over 20% in 1974.

Distribution of coal production by mining methods, in percent, follows:

| | |
|---|---|
| Longwall | 85 |
| Slicing | 8 |
| Shield | 3.2 |
| Room and pillar | 1.7 |
| Others | 2.1 |

In 1974, the average longwall length was 132 meters, and the average rate of advance was 39.4 meters per month. The average capacity of each underground mining section (longwall) was 440 tons of raw coal per day (four 6-hour shifts) in 1974.

Raw coal production by principal basin in 1974, in million tons, follows:

| | |
|---|---|
| Donets | 219.5 |
| Kuznetsk | 128.3 |
| Karaganda | 45.2 |
| Moscow | 35.0 |
| Pechora | 23.3 |
| Others | 232.7 |
| Total | 684.0 |

The Donets, Kuznetsk, Karaganda, and Pechora coal basins together produced 80% of the total coal output in terms of calorific value and about 97% of the coking coal in the Soviet Union. Some salient characteristics of the coal and other data of these basins are given in table 7.

## Table 7.—U.S.S.R.: Major coal basins

| Basin | Type of coal mined | Number of workable seams | Seam thickness (meters) | | | Depth of mining (meters) | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | Minimum | Maximum | Average | Minimum | Maximum | Average | |
| Donets | Bituminous and anthracite. | 40 | 0.5 | 1.6 | 0.95 | 100 | 1,150 | 470 | It has large reserves represented mainly by thin seams. Two-thirds of the reserves are high-grade coals of which one-half are coking coals. More than 70% of the coal production comes from flat seams (0–25 degrees pitch). |
| Kuznetsk | Bituminous and lignite. | 68 | .8 | 20.0 | 2.23 | 50 | 400 | 250 | Over 90% of coal is produced from seams over 1.2 meters thick and nearly 22% from seams over 6.5 meters thick. Coking coal comprises over 20% of the reserves. Recently an extensive use of opencast mining has taken place in the basin. |
| Karaganda | Bituminous | 45 | .7 | 7.5 | 1.79 | 100 | 400 | 330 | About 97% of the coal seams are flat. More than 50% of the reserves are coking coals. |
| Pechora | do | 39 | .5 | 4.5 | 1.90 | 150 | 500 | 430 | The basin has large reserves of coking coals. Over 65% of coal is produced from flat seams. |
| Moscow | Lignite | 2 | .9 | 3.5 | 2.27 | 50 | 100 | 61 | Brown coal has an ash content of about 45%. The coal seams are flat. The main consumers of the coal produced in this basin are power-plant and domestic heating of the central regions of the U.S.S.R. |

According to plan, production of raw coal and lignite will increase to 700 million tons in 1975 and 800 million to 810 million tons in 1980. As earlier scheduled quantitative goals were not met, the original yearly targets for 1959–71 were revised and the surface mining of low-quality lignite was increased. Reports of persistent and chronic labor shortages and low-labor productivity indicate that production of high-quality coal (mainly by underground mining) may fall slightly short of planned targets, while the output of lower rank coals and lignites may be increased substantially in the future. Estimated levels of all coal production for 1975 and 1980, therefore, may be 700 million tons of raw coal (400 million tons of clean coal) and 805 million tons of run-of-mine coal (460 million tons of clean coal), respectively. Soviet long-range forecasting places the demand for raw coal and lignite in the year 2000 at around 1 billion tons, even though oil, natural gas, and nuclear power are developed to a maximum. Coal, therefore, will remain the principal source of energy for industrial use.

Over the next 10 years, priority has been given to coal development in the Asian part of the country (chiefly in the Kuznetsk Basin), where planned gross production is to reach 228 million tons in 1975 and 300 million tons in 1980.

The Kansk-Achinsk Basin and the Itat deposit in Siberia and the Ekibastuz and Maykuben deposits in Kazakhstan are the sites of the largest develoment of surface mining of low-quality coals and lignite. In the European part of the U.S.S.R., most of the new coal production is to come from the Donets coal basin. But because of the anticipated shortage of fuel, plans are to develop by 1980 seven new mines, with a total capacity of 14 million tons of raw lignite in the Moscow Basin. These mines will supply thermal electric powerplants located in the central areas of the European part of the U.S.S.R. The output of coal for coking is to be increased substantially in the Donets, Kuznetsk, and Karaganda Basins.

Because of location of deposits and mining methods, the production cost of coal varies widely in the U.S.S.R. Available cost data on Soviet coal output indicate that production costs of coal in the Asian part of the U.S.S.R. is 20% to 30% less than those in the European regions of the country.

The planned goals for coal and lignite production, actual output, and the author's estimates for 1960, 1965, 1970, 1975, and 1980 are shown in figure 1.

*Coal Reserves.*—Published estimates of Soviet coal resources must be interpreted in terms of our own standards for measuring coal reserves to arrive at some meaningful understanding of the data. According to the Soviet classification, the reserves of coal are divided into two parts: *Balansovye* (identified, economically minable reserves in place) and *Zabalansovye* (identified, submarginal but minable reserves in place). Each part is subdivided into four categories: "A", "B", "$C_1$", and "$C_2$". Reserves in category A are reserves that are prospected in detail and measured (comparable with U.S. measured reserves in place). Category B includes reserves which are also measured as in A except that detailed quantitative and qualitative data are not accurate enough for inclusion in category A. Category B may be equated with indicated reserves in place in customary U.S. usage. Category $C_1$ might be equated with U.S. inferred reserves in place which are determined by geophysical research and by sundry scientific investigation and observation of natural outcroppings. Soviet category $C_2$ might be equated with the undiscovered, hypothetical (in known districts), and speculative (in undiscovered districts) reserves in place in the usual U.S. terminology.

The official hypothetical and speculative coal resources of the U.S.S.R. are large, but they are no more than geologic prognoses that have yet to be confirmed and explored. According to the estimates made in 1968, Soviet official geological reserves of coal and lignite account for 6,800 billion tons, or about 55% of world coal reserves. Of these, 4,050 billion tons are reserves of hard coal and 2,750 billion tons are reserves of brown coal and lignite. But official Soviet economically minable reserves (the so-called balansovye) of coal and lignite in place in the A, B, $C_1$, and $C_2$ categories are only 523.7 billion tons (including 334.1 billion tons of hard coal and 189.6 billion tons of brown coal and

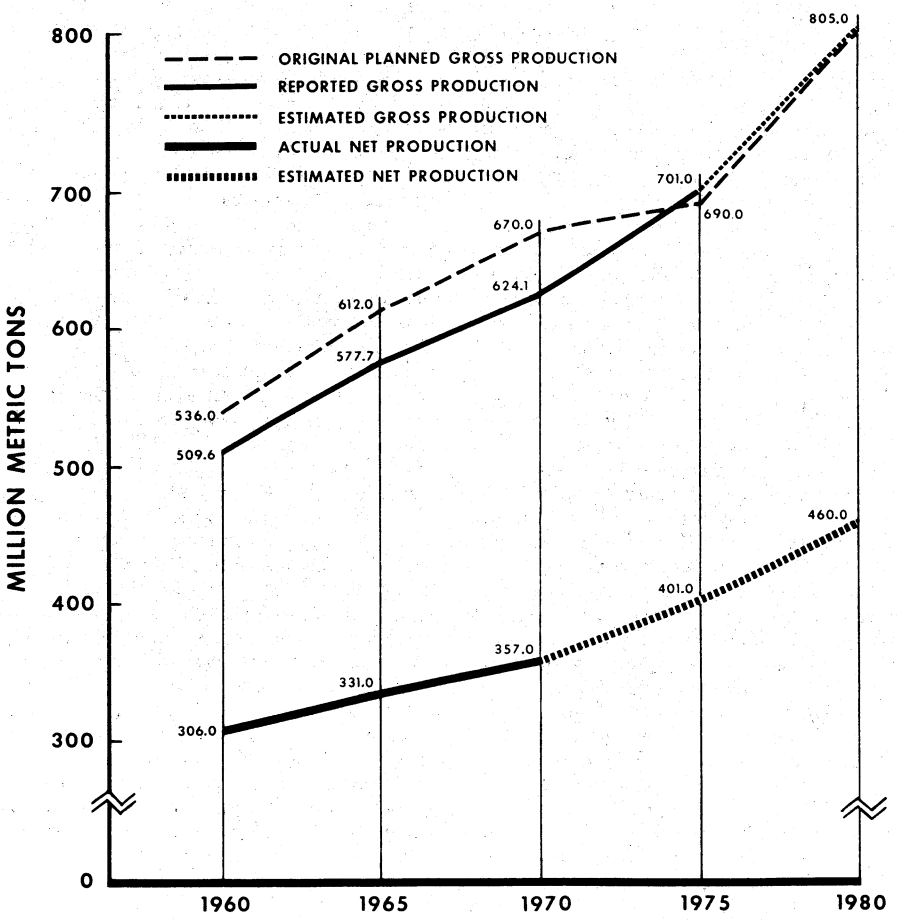


**Figure 1.—Soviet coal production, actual and estimated, 1960–80.**

lignite), or only about 8% of total geological resources.[8]

Economic minable coal and lignite reserves, by basin and category, are shown in table 8.

**Table 8.—U.S.S.R.: Soviet economic minable reserves (balansovye) of coal and lignite, by basin and category, on Jan. 1, 1968**
(Billion metric tons)

| Regions, coal basins, and deposits | Categories | | Total |
|---|---|---|---|
| | A+B+C1 | C2 | |
| Donets Basin | 40.5 | 16.8 | 57.3 |
| Pechora Basin | 8.0 | 6.8 | 14.8 |
| Moscow Basin | 5.0 | 2.3 | 7.3 |
| Lvov-Volyn Basin | .7 | -- | .7 |
| Dneprovsk Basin | 2.6 | .1 | 2.7 |
| Caucasus | .4 | .04 | .44 |
| Kizelovsk Basin | .6 | .1 | .7 |
| Chelyabinsk Basin | .9 | .04 | .94 |
| South Urals | 1.3 | -- | 1.3 |
| Karaganda Basin | 7.5 | 6.9 | 14.4 |
| Ekibastuz Deposit | 7.4 | -- | 7.4 |
| Maykuben Basin | 1.8 | -- | 1.8 |
| Turgay Basin | 6.3 | .4 | 6.7 |
| Kuznetsk Basin | 66.2 | 144.4 | 210.6 |
| Minusinsk Basin | 2.8 | -- | 2.8 |
| Kansk-Achinsk Basin | 72.0 | 43.2 | 115.2 |
| Irkutsk Basin | 7.1 | 13.4 | 20.5 |
| Tungussk Region | 1.9 | 3.0 | 4.9 |
| Taymyr Region | .1 | .6 | .7 |
| Lena Region | 2.3 | 1.0 | 3.3 |
| Yuzhno-Yakutsk | 2.6 | 3.3 | 5.9 |
| Zyryansk Basin | .2 | -- | .2 |
| Buryat A.S.S.R. | 2.4 | 1.9 | 4.3 |
| Chita Oblast' | 3.2 | .02 | 3.22 |
| Amur Oblast' | 2.1 | .05 | 2.15 |
| Khabarovsk Kray | .8 | 1.2 | 2.0 |
| Maritime Kray | 2.5 | 1.7 | 4.2 |
| Sakhalin Island | 2.0 | 1.5 | 3.5 |
| Magadan Oblast' | 1.3 | 3.3 | 4.6 |
| Kamchatka Oblast' | .07 | .06 | .13 |
| Kirghiz S.S.R. | 1.5 | 2.0 | 3.5 |
| Uzbek S.S.R. | .7 | .5 | 1.2 |
| Tadzhik S.S.R. | .7 | .5 | 1.2 |
| Others | 5.96 | 7.13 | 13.09 |
| Total | 261.43 | 262.24 | 523.67 |

Source: Kratkiy spravochnik gornogo inzhenera (Short Reference Book of the Mining Engineer). Moscow, 1971, p. 8.

The composition of the U.S.S.R. coals according to rank is as follows: Anthracite, semianthracite, and lean coals, 10.2%; coking coal, 21%; gas coal, 20.3%; long-flame coal, 10.9%, subbituminous coal, 1.4%, and brown coal and lignite, 36.2%. Thus, over half of the minable reserves consist of anthracite and bituminous coals. The chief coking coal reserves occur in the Donets, Kuznetsk, Karaganda, Pechora, Kizel, Tkvarcheli, and Tkvibuli basins.

Coal and lignite reserves, by rank and by major basin, are presented in table 9, and by area and category, in table 10.

[8] Kratkiy spravochnik gornogo inzhenera (Short Reference Book of the Mining Engineer), Moscow. 1971, pp. 5–15.

**Table 9.—U.S.S.R.: Soviet economic minable reserves (balansovye) of coal and lignite by rank and major basin on Jan. 1, 1968**
(Billion metric tons)

| Basin | Anthracite, semi-anthracite and lean coals | Coking coal | Gas coal | Long-flame coal | Sub-bituminous | Brown coal and lignite | Total |
|---|---|---|---|---|---|---|---|
| Donets | 16.8 | 9.4 | 22.7 | 8.5 | -- | -- | 57.4 |
| Kuznetsk | 32.3 | 60.4 | 61.2 | 30.3 | 1.1 | 25.3 | 210.6 |
| Karaganda | -- | 13.5 | -- | -- | -- | 1.0 | 14.5 |
| Pechora | .35 | 8.3 | 4.1 | 3.3 | -- | .56 | 16.6 |
| Other | 4.1 | 18.4 | 18.3 | 14.7 | 6.3 | 162.7 | 224.5 |
| Total | 53.6 | 110.0 | 106.3 | 56.8 | 7.4 | 189.6 | 523.7 |

Source: Kratkiy soravochnik gornogo inzhenera (Short Book of the Mining Engineer). Moscow, 1971, p. 9.

Table 10.—U.S.S.R.: Soviet economic minable reserves (balansovye) of coal and lignite, by area and category, on Jan. 1, 1968
(Billion metric tons)

| Area | Economic minable reserves in place | | |
|---|---|---|---|
| | A+B+C1 | C2 | Total |
| European U.S.S.R | 59.1 | 26.1 | 85.2 |
| Urals | 1.8 | .2 | 2.0 |
| Asian U.S.S.R | 200.5 | 236.0 | 436.5 |
| Total | 261.4 | 262.3 | 523.7 |

Source: Economic Commission for Europe, Coal Committee, VAB/SYMP/COAL/A-10, May 20, 1969, p. 2.

*Mine Planning and Construction.*—Soviet literature contains many reports on construction problems in the coal industry, citing shortage of equipment, materials, and labor as well as lack of work organization as causes. Construction of new projects is still slow, expensive, and frequently below Western established professional standards. Traditionally, Soviet efforts in the construction of coal enterprises have been dispersed over a large number of projects, and the period of construction has been long compared with equivalent construction Western countries. An example of the lag in development schedules, in months, may be seen from the figures[9] shown in the following tabulation:

| Project | Planned time | Actual time |
|---|---|---|
| The Anzher coal mine, Kuznetsk Basin | 52 | 248 |
| The 21-bis coal mine, Donets Basin | 74 | 174 |

Development of the Raspadskaye underground coal mine in the Kuznetsk Basin, with an annual capacity of 2 million tons of raw coal, began in 1960, and during the subsequent 13-year period only half of the planned installations have been completed. Two thousand workers were employed at this project in 1972.[10]

The delay in completion of projects has sometimes resulted in disparities between the capacity of the mine, the preparation plant, and consumer plant. The practice of resorting to expedients in order to meet operating schedules of mines and beneficiation plants has resulted in subsequent inefficiencies.[11] Planned labor productivity lags far behind design indicators, and delays are necessary to achieve planned capacity. Mine renovation schedules are also delayed. It was reported in 1973 that 217 old, underground coal mines (28% of the total in operation), producing 103 million tons of raw coal per year, have not been modernized for 20 years.[12] Certain Republics and organizations, trying to attract large development appropriations in their area, may exaggerate the value of local coal deposits. According to Soviet reports, many projects have to be dropped after expensive reinvestigation. Thus, vast sums of money are often spent in developing uneconomic mines.

Each year the capital investment plan (in rubles) is almost fulfilled, but the plan for the completion and formal transfer of new capacities for operation is not fulfilled; in several projects of the coal industry, a shortfall of 40% or even more has been reported. Project completion delays resulted in large overexpenditures. Losses are incurred not only because of construction delays, but also because of long lead times to develop production at new mines which have been put into operation. Several years usually pass before the volume of output reaches the planned level. If one adds to this the period required for planning and construction, then the total time for a given enterprise to come into full production comes to 10 to 12 or

[9] Veprosy ekonomiki (Problems of Economics), Moscow. No. 8, August 1973, p. 37.
[10] Sovetskiy shakhter (Soviet Miner), Moscow. No. 3, March 1973, p. 21.
[11] Veprosy ekonomiki (Problems of Economics), Moscow. No. 8, August 1973, p. 34.
[12] Ugol' (Coal), Moscow. No. 8, August 1973, pp. 70–74.

even more years. During these years, machinery becomes obsolete and the return of capital invested is much smaller than expected.

The goals of the 7-year plan (1959–65) and of the 5-year plan (1966–70) for the development of coal mines and the construction of coal preparation plants as they were originally published were not fulfilled. Only 40% of the target of the coal preparation plant construction of the 7-year plan (1959–65) was met.[13]

During the 5-year plan (1966–70) capacities for the mining of 92.4 million tons of raw coal per year and for the preparation of 42.9 million tons per year were put into operation. Capital investment on development of production capacity for the 1960–70 period was about 8 billion rubles.[14] The 1971–75 plan foresees commissioning of coal mines and open pits with a total yearly capacity of 140 million tons of run-of-mine coal and capacities for preparation of 55.5 million tons per year. Capital investment in the Soviet coal industry for the 1971–75 period has been set at a level of over 10 billion rubles. During the 1966–72 period, development of new deep and surface mine capacity fell short of the goal by over 43 million tons of raw coal.

The yearly capacity of coal and lignite mines and open pits was increased by 19.4 million tons (raw coal) in 1974, or by 72% of planned target. The more important enterprises put into operation included the first stage of the Krasnoarmeyskaya-Kapital'naya underground mine in the Donets Basin. The goal of the 1974 plan in coal preparation plant construction was fulfilled by 64%.

*Geographical Distribution.*—The systematic increase in the demand for coal (mainly in the European part of the U.S.S.R.) and the technical difficulties accompanying the development of the Donets Basin were reflected in the radical alteration of geographic distribution of the coal industry in the U.S.S.R. after World War II. New local bases for the production of low-calorie coal were created and played a prominent role in the fuel balance of the U.S.S.R. The geographical distribution of the coal industry was greatly altered during the past two decades. Coal production shifted eastwards. Between 1950 and 1974, the transportation of coal from Siberia and Kazakhstan to the Center and Volga regions of the European part of the U.S.S.R. increased 14 times and reached 36 million tons per year.

With an output and delivery to consumers of 684 million tons of run-of-mine coal in 1974, railroads transported over 600 million tons of coal and coke over an average distance of over 700 kilometers. Coal and coke accounted for more than 20% of all railroad freight carried in 1974.

The increased importance of the Asian regions of the country in the production of coal, while the main consumption remains in the European part of the U.S.S.R., will inevitably be accompanied by increased interregional traffic of coal and will require additional capital investment to expand the capacity of the railroads and to increase the rolling stock. This also calls for intensive expansion work on the part of the railroads to meet the anticipated workload. Consumers who receive the coal which has been shipped over long distances are not in a position to benefit from the economic advantages of using cheaper (in Btu value) coal from the Donets Basin.

*Surface Coal Mining.*—The growth in production of coal by surface mining has a high priority in the Soviet Union. Almost one-third of the coal and lignite output is to come from open pit mines by the end of the 1971–75 5-year plan. The increase is to be achieved mainly as a result of the development of coal deposits of Siberia and Kazakhstan.

Stripping operations in the Soviet Union are based on the use of 15- and 25-cubic-meter walking draglines, 4- to 8-cubic-meter shovels, and dumpers of 27- and 40-ton capacity. The largest walking dragline is presently being installed at the Nazarov surface coal mine. The first Soviet 65-ton truck, built in Byelorussia, was being tested at a surface coal mine in Eastern Siberia in 1973 and 1974.

At present, surface coal mining is practiced in 12 regions of the U.S.S.R. Total Soviet coal and lignite output is scheduled to increase 71 million tons during 1971–75. One-third of this increase is to come from the Ekibastuz Basin in northeast Kazakhstan, which is to have an annual production of 56 million tons by 1975.

[13] Ugol' (Coal), Moscow. No. 1, 1967, pp. 6–7.
[14] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 26, June 1971, p. 4.

The Ekibastuz Basin contains 7.4 billion tons of coal in an area of 160 square kilometers. The deposits lie at shallow depths where the total thickness of three seams fluctuates from 120 to 192 meters; the workable thickness of these seams is 86 to 143 meters. The ash content of the coal in seams fluctuates between 25% and 52%, and that of coal shipped to consumers averages 40% to 45%. Some 40 million tons of raw coal was produced at this basin in 1974. The Central, South, and four sections of the Bogatyr' open pits were in operation. The fifth section of the Bogatyr' open pit was commissioned in February 1974. The annual capacity of all five sections of the Bogatyr' open pit is now about 25 million tons of raw coal. About 100 excavators of various types are used in overburden removal and mining. Five of them have a capacity of 1,000 tons per hour, and two of them, 3,000 tons per hour. Four "1,000" and one "3,000" bucket-wheel excavators operate in the Bogatyr' open pit. All seven bucket-wheel excavators were manufactured in East Germany.

Seventeen thermal powerplants in Kazakhstan, the Urals, and Siberia, with a total capacity of over 8 million kilowatts, operate on Ekibastuz coal. It is planned to build four additional thermal powerplants in this area with a total capacity of 16 million kilowatts to serve the European part of the U.S.S.R.

*Hydraulic Mining.*—In 1974, hydraulic mining yielded some 11 million tons of raw coal, which came from nine hydraulic underground coal mines and five hydraulic sections of conventional underground coal mines. In Soviet practice, hydraulic coal mining involves primarily hydraulic transport from the production face to the mine surface. Actual cutting of coal is done by a combination of conventional and hydraulic methods. Labor productivity is 50% below that planned, costs proved to be double, and operational losses of coal (up to 46%) are 2.3 times the design levels. Consumption of electric power at hydraulic mines in the Kuznetsk coal basin is over 50 kilowatt-hours per ton of coal, and consumption of water is 7.7 to 27 cubic meters per ton. The Ministry of Coal Industry decided several years ago to postpone new hydraulic mine development until some of the technical problems were overcome.

*Underground Gasification.*—The first large-scale experiments in underground coal gasification were undertaken in the U.S.S.R. during the 1930's. Since 1946, experimentation and development have been greatly intensified and by 1960 the process of underground gasification of coal was apparently on the threshhold of commercial use. Some of the most critical problems of commercial utilization of gas from underground coal gasification have not as yet been solved. Among them, the two most important are (1) to obtain a continuous and controlled gasification process and (2) to produce gas at competitive cost levels. Yearly underground coal gas production targets for 1960–73 were abandoned because they proved to be unrealistic.

The level of Soviet gas production from underground coal gasification for selected years, in million cubic meters, follows:

| | |
|---|---|
| 1940 | 167 |
| 1950 | 226 |
| 1960 | 1,448 |
| 1965 | 1,175 |
| 1969 | 1,138 |
| 1970 | 1,053 |
| 1974 [e] | 1,500 |

[e] Estimate.

*Mining Machinery and Technology.*—The technology of the Soviet coal industry is generally below the level of West European coal-producing countries in (1) the application of narrow-web coal face cutting; (2) mechanized loading; (3) mechanized roof support work; and (4) mechanized tunneling. A prop-free-face system and coal planners in Soviet longwall coal mining came into use some 12 years after their introduction in the coal mines of the United Kingdom and West Germany.

In April 1973, the Central Committee of the Communist Party adopted a resolution on technical reequipment of the coal industry. The resolution notes that many labor-intensive production processes in mines are not mechanized and that a large number of production faces are equipped with obsolete machinery and mechanisms.

In coal mine development, tunneling machines are used in only 25% of drifting operations. At large coal-producing concerns such as Kizelugol' (Urals), Rosto-

vugol' (Donets Basin), and Gruzugol' (Georgian S.S.R.), no drifting is done by tunneling machines.[15]

In many faces equipped with wide-web continuous miners and cutters, large amounts of coal were being extracted by blasting. The productivity of narrow-web continuous miners was two to three times below established norms. A low-degree of machine utilization in coal mining stems from defective construction, lack of sufficient repair shops and spare parts, poor work organization, and poor training of operators. As a rule, mining machines are operated 22 to 24 hours per day, and expensive equipment is worked until it breaks down. Under such conditions it is difficult to organize timely, proper preventive maintenance for equipment.[16] On the average, continuous miners remain idle 65% to 70% of the worktime.[17]

There were no high-efficiency continuous miners for hard coal, while the utilization of cutter-loaders on steep seams did not increase labor productivity significantly. Therefore, coal-cutting equipment for the mining of steeply dipping seams has been purchased from France and is being assembled at the mines of the Prokopyevskugol' Administration in the Kuznetsk Basin.

The production of mining equipment, especially for mechanizing auxiliary processes, proceeds slowly, according to Soviet press reports, and spare parts output for mining machinery is inadequate. The available machinery did not supplant manual labor at coal mines. The work performed manually with machines comprises 60% at longwalls, 57% in development, and 100% in repair of workings.[18] Manual labor is used almost exclusively in longwall roof support (79,000 workers), loading of coal in longwalls (49,000), roof support in development workings (24,000), loading of coal and rock in development workings (20,000), and repair of workings (76,000 workers).[19]

It was reported that Soviet expenditures for pit props are enormous. The delivery of pit props, which are not to specification, is common and requires additional mine labor to correct deficiencies. At present, 40 to 45 cubic meters of prop timber (compared with 34.9 cubic meters before the Revolution of 1917) are used per 1,000 tons of coal output. In addition, losses of metallic supports are in excess of the established norms. The installation of roof bolting has not yet been fully mechanized.

The number of the main mining machines and mechanisms at U.S.S.R. coal mines in 1973 is given in the following tabulation:

| | |
|---|---|
| Cutter-loaders | 3,937 |
| Cutters | 305 |
| Tunneling machines | 1,191 |
| Loading machines | 4,487 |
| Chain conveyors | 34,708 |
| Belt conveyors | 12,708 |
| Trolley mine locomotives | 13,554 |
| Excavators | 1,363 |
| Air picks | Large |
| Air hammers | Large |
| Air drills | Large |
| Electric drills | Large |

Source: Narodnoye khozyaystvo S.S.S.R. v 1973 godu (National Economy of the U.S.S.R. in 1973,) Moscow. 1974, p. 263.

*Labor Productivity.*—

> The subject of statistics is considered as a party, class and social science . . . U.S.S.R. statistics, based on the doctrines of the classic of Marxism-Leninism, gives a correct and exact account of all the sides of the process of expanded social reproduction.[20]

This quotation is illustrative of an admitted bias in statistical reporting. Perhaps nowhere is this bias more evident than in the coal industry's reporting of productivity.

The low productivity of miners in the first 5-year plan (1928–32) forced Soviet planners to introduce a new system of calculation of labor productivity on the basis of the "production" worker category, rather than to include all mine workers, which had been the practice. The new method of calculation gave a "cosmetic" improvement to official indicators of labor

[15] Ugol' (Coal), Moscow. No. 8, August 1973, pp. 70–74.
[16] Sotsialisticheskaya industriya (Socialist Industry), July 7, 1972, p. 2.
Sovetskiy shakhter (Soviet Miner), Moscow. No. 10, October 1973, pp. 6–7.
Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 4, April 1973, p. 47.
[17] Ugol' (Coal), Moscow. No. 8, August 1973, pp. 70–74.
[18] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Oct. 5, 1972, p. 2.
[19] Ugol' (Coal), Moscow. No. 8, August 1972, p. 2.
[20] Mikheyev, G. F. Ekonomika, organizatsiya proizvodstva i planirovaniye v ugol'noy promyshlennosti S.S.S.R. (Economics, Organization of Production and Planning in the Coal Industry of the U.S.S.R.) Moscow. 1957, p. 483.

productivity and to the earnings of workers in the coal industry during the first 5-year plan and has been maintained ever since.

The change in calculating indicators of labor productivity had the effect of raising the reported average earnings of the workers because of the preponderance of higher paid underground miners in the select group of production workers. The change in productivity calculations also obscured the results of productivity trends during 1924–28, a short period of market economy and relative industrial autonomy in the Soviet Union. Furthermore, the 5-year plan data on productivity could not validly be compared with data for any other period.

One might also note that statistics of accidents and fatalities in all branches of the Soviet economy, including the coal industry, are not published although available data indicate that there are many fatalities.

The only official employment and labor productivity data released in the U.S.S.R. refer to "production" workers ("Rabochiye po dobyche"). Unlike the customary practice in West European countries and the United States, and also unlike the method used in the United Nations Committee for Coal, many categories of personnel (including more than 60,000 workers employed at the coal preparation plants) are not included in the "production worker" group.

In 1974, the official average monthly (25.4 shifts) productivity of Soviet coal miners was 73.1 tons (54.3 tons per month in underground mines and 391.2 tons per month in surface mines). But these data relate only to "production" workers. Official data on the number of "production" workers used in labor productivity calculations, include only about two-thirds (from 57% to 70% depending on coal basins) of all workers normally counted in computing labor productivity by the method used in the United Nations Committee for Coal. Further, productivity statistics on the Soviet coal industry are reported for gross production, whereas it is customary elsewhere to measure output and productivity in terms of marketable coal.

If the above indexes are taken as reasonably accurate, actual labor productivity in Soviet coal mines is about one-third of that reported, according to Western terms of reference. The actual productivity is about one-third of that of the coal miners of Great Britain and West Germany and nearly one-twelfth of that of the miners in the United States.

Since most Soviet coal comes from underground mines and the Donets Basin is by far the most important center of underground mining, the history of progress of labor productivity at this basin may be indicative of the industry as a whole.

In 1913, the average monthly productivity of the worker of the Donets Basin was 13 tons, while the per shift productivity of commodity coal was 0.61 ton.[21]

In 1974, average monthly official productivity of the "production" workers in the Donets Basin was 43.9 tons[22] of run-of-mine coal, or 25.1 tons of clean marketable coal. Actually, the productivity of a Donbass miner in 1974 amounted to only 0.95 ton of commodity coal per shift, that is, it increased only by 0.34 ton in 56 years, despite the immense technical progress that had taken place elsewhere in the world during this period.

Because of low productivity, the Soviet Union was not able to supply fuel requirements for the economy from the Donets Basin, which contains immense reserves of high-quality coal.

This difficulty to supply fuel was the main reason for the geographic transfer of a large part of the Soviet coal industry to the Asian part of the U.S.S.R. and for shipping coal by rail from Kuznetsk and Karaganda to supply the industrial regions of the Volga, the Center and, in part the Urals. Colossal losses are sustained annually because of superfluous shipping expenses which exceed many times any savings achieved by extracting coal by surface mining in Siberia and Kazakhstan. Soviet planners are compelled, therefore, to increase the economically unprofitable production of brown coal and lignite on a massive scale and to lower systematically the quality of the coal produced.

*Labor and Salary.*—The piece-rate principle, previously denounced as a capitalist exploitation of workers, has become a principal feature of the coal mining industry of the U.S.S.R. A basic feature of Soviet

[21] Bratchenko, B. F. Perspktivy razvitiya ugol'noy promyshlennosti S.S.S.R. (The Prospects of the Development of the Coal Industry of the U.S.S.R.) Moscow. 1960, pp. 337–338.

[22] Ugol' (Coal), Moscow. No. 4, April 1975, p. 71.

labor legislation is that workers are obliged to achieve a specific minimum output within a specified period of time. This minimum is the work norm and is established for virtually every phase of employment.

While the trade unions in Western countries are principally wage-bargaining organizations, their Soviet counterparts have other functions and objectives. With no wage bargaining, the Soviet trade union functions mainly to increase labor productivity.

The number of legally prescribed working hours per week is 41 hours on the surface and 36 hours underground. There are 4 shifts per day (6 hours each shift) in underground coal mining and 3 shifts per day (7 hours each shift) on the surface. There are 330 working days per year.

Because of low growth rates in coal production, the mines are assigned additional tasks each year, and this led to Sunday and holiday operations.[23]

*Coal Preparation.*—Preparation of coal for the market does not play a great role in the industry and is normally restricted to coking coals and coal for export. The shortage of coal beneficiation facilities forced Soviet planners to place greater emphasis on improvements in quantity as an expedient. Multistage manual preparation underground at longwall operations and belt picking conveyers was in wide use. Only 40% of the goal of the 1959–65 7-year plan in coal preparation plant construction was fulfilled. The target of the 1966–70 5-year plan in coal preparation plant construction was also not met. Current plans are to commission 15 new preparation plants with a total annual capacity of 55.5 million tons of raw coal during 1971–75. Contrary to the rising world trend, the preparation of coal in the Soviet Union has declined in recent years.

Practically all Soviet coal requires beneficiation, but of the 684 million tons produced in 1974 preparation plants run by the Ministry of Coal Industry processed only 264.6 million tons to produce 150.4 million tons of clean coal.[24] This gives a recovery factor of 0.57, a value which may be used to calculate equivalent clean-coal tonnage. About one-fourth of all the coal beneficiated is treated on delivery to plants associated with the coking industry of the Ministry of Ferrous Metallurgy. According to Soviet sources, 61.4% of coal beneficiated was washed, 16.8% was treated by heavy media, 13% was prepared by pneumatic methods, 8.6% was treated by flotation, and 0.2% was cleaned by other methods.

Unsuitable underground mining machinery and the shortage of beneficiation facilities led to the deterioration of the main components of fuel quality, ash content, and size. Very few machines yield large lumps, and their technical quality is low.[25] The large proportion of fines in coals shipped to Soviet preparation plants (50% to 70%, compared with 30% to 40% delivered to the plants of West European countries), greatly complicates the comparatively low level technology of coal preparation, raises costs, and lowers the productivity of labor and plants.

According to Soviet sources, many new preparation plants were put into operation in spite of numerous imperfections and insufficient equipment. Labor productivity and the utilization of capacity were below planned levels, and a large number of workers were occupied in repair and auxiliary operations. Practically all coal preparation plants maintained greater numbers of production personnel than called for by plan targets. Fifty-three plants of the Ministry of the Coal Industry were put into operation after 1960; they employed 7,400 workers above the number envisaged in the plan. There were over 60,000 workers in the Soviet coal preparation industry in 1974.[26]

All 143 coal preparation plants of the Ministry of Coal Industry, on the average, are idle about 30% of working time. Many plants are not fulfilling the plans on coal processing, labor productivity, and other planned indexes. The delivery of a large amount of coal with deviations from the standards is indicative that the mines and preparation plants give little attention to the quality of coal shipped.[27] For example, with a higher percentage of ash than is indicated in the documents given by the suppliers, 384,000 tons of coal in 1972 and about 250,000 tons in 1973 were sent back to producers and dumped into the waste piles at the mine.

[23] Pravda, Moscow. Aug. 25, 1973, p. 3.
[24] Ugol' (Coal), Moscow. No. 4, April 1975, p. 70.
[25] Pravda, Moscow. Oct. 24, 1973, p. 3.
[26] Koks i khimiya (Coke and Chemistry), Moscow. No. 11, November 1972, pp. 4–6.
[27] Ugol', Moscow. No. 8, 1973, pp. 70–74.

During 1928–74, the official quality of marketable coal declined 41% from the average 6,940 kilocalories per kilogram in 1928 to about 4,900 kilocalories per kilogram in 1974. The officially reported ash content of coals shipped from the mines has increased from 19.4% in 1965 to 20.1% in 1974 and some lower grade lignites used in home heating and power generation have been reported to contain as much as 45% ash. In wintertime, preparation plants sometimes dispatch wet coal, which freezes in transit into a solid mass, and thus becomes impossible to unload.[28]

*Losses of Coal.*—Because Soviet coal preparation facilities are inadequate, losses in the fuel efficiency of the overall economy are staggering. Among the most prominent negative effects of inadequate coal preparation and classification are (1) inefficient combustion because of the refuse contained in the coal; (2) high rail transportation costs increased by moving the inert wastes in coal; (3) additional supply burdens caused by the displacement of specific coals to accommodate transportation problems; and (4) aggravated existing shortages leading to still further economic dislocations of resorting to more costly expedients, crosshauls of coals, and inadequate use and underuse of rail equipment.

The results of these negative factors are not known completely, because they have not been adequately quantified or reported widely in the Soviet press. Estimates of coal losses due to the use of unprepared coals at electric powerplants in 1974 were placed at about 25 million tons in terms of raw coal. Rail transportation of untreated coal (average haul in 1974 over 700 kilometers) resulted in the loss of 33 million tons of raw coal or about 5% of the total output. To avoid delays in extracting and dispatching coal, mines are forced to accept damaged railway cars and repair them under primitive conditions. A daily load equal to 55,000 cars would result in an expenditure of "tens of millions of rubles."[29] Annual losses in rail transportation were reported at about 10 million tons of coal and additional expenditures for cleaning up coal spills from the railroads, at 50 million rubles.[30]

These losses add to existing shortages and intensify the drive to stimulate production which leads to a vicious circle of still greater emphasis on expedient quantity, frequently at the expense of quality.

The Soviet coal consumer cannot always get the kinds of coal best suited to his needs. The many obstacles hindering production and delivery of the more desirable coals also decrease effectiveness of the available coals. This low utilization factor is the principal reason for the lack of insight into the real problems of Soviet coal. Many statements, comparisons, and evaluations published in the West are concerned with only a superficial reporting of Soviet statistical data.

It is estimated that the Soviet economy suffers about a 35% loss because of inefficiency in production, transportation, and use of unprepared coal.

*Consumption.*—The consumption of coal remains centered in the European part of the U.S.S.R., and the bulk of the coal mined in the Asian part of the country is shipped to meet consumer requirements in established European industrial centers. More than one-third of all coal and lignite mined in the U.S.S.R. goes into electricity generation and one-quarter is coked. Coal and lignite are also used as household fuels in cities and towns. The consumption of coal in preference to oil, wherever possible, is encouraged as a means of increasing the availability of oil for export.

The most promising markets where coal consumption is expected to expand are electric powerplants, metallurgy, and retail deliveries. By 1980, coal consumption by electric powerplants is expected to increase to about twice the 1970 level. The share of coal in electric power generation is expected to fall from 49% in 1970 to about 45% in 1980.

*Exports.*—The Soviet Union became a net exporter of coal and coke in 1956 and has gradually strengthened its position since that time. Coal exports increased from 5.7 million tons in 1956 to 26.2 million tons in 1974, while exports of coke increased from about 2 million to 4.6 million tons during the same period.

Over one-third of the coal exported and about 1 million tons of coke were shipped to market economy countries in 1974. Among the major market economy markets for Soviet coal, Japan ranks first, followed by Italy, France, and Austria. Coals ex-

[28] Pravda, Moscow. Jan. 28, 1974, p. 1.
[29] Pravda, Moscow. Jan. 13, 1974, p. 3.
[30] Pravda, Moscow. Nov. 27, 1973, p. 3.

ported to the West are high-quality coking coals and anthracite mainly from the Donets and Kuznetsk Basins.

One very important aspect of Soviet coal for export is the cost-price relationship. The actual cost of production may not always figure in the selling price of coal in the West. The high national priority placed on exports, which must meet high international competitive price and quality standards, makes Soviet coal exports successful only at supported prices in Western terms of reference.

The relative share of coal and coke in the official aggregate exports increased from 3.2% in 1970 to 3.6% in 1974. The Soviet policy of increasing exports of high-quality coal and coke to market economy countries is expected to continue in the future, although these exports are not likely to grow significantly. As in the past, the market for coal and coke from the U.S.S.R. will be limited to established coal-deficit markets in Europe (Eastern and Western countries) and Japan.

An agreement on Japanese assistance in the development of the Neryungra coalfield in the southern region of Yauktia was signed on April 30, 1974. Under the agreement, Japan is to provide the Soviets with $450 million worth of coal mining and railway equipment between 1975 and 1981. Exports of coal from this field to Japan will begin in 1983 at the level of 3.2 million tons per year, increasing to 5.5 million tons in 1985 and are expected to increase through 1998. The Soviet Union will export an additional million tons of Kuznetsk coal to Japan each year during 1979–98 and is building a large coal transhipping complex at Wrangel port, about 100 kilometers from Vladivostok in the Soviet Far East. Construction of this deepwater port has been designed with the aid of Japanese engineers.

According to signed trade agreements, during 1966–70 the U.S.S.R. was to deliver the following quantities of coal, in million tons, to the following countries:

| | |
|---|---|
| East Germany | 31.5 |
| Czechoslovakia | 19.0 |
| Yugoslavia | 5.0 |
| Hungary | 4.6 |

The steady flow in Soviet exports of coal and coke to centrally planned economy countries is planned to grow from an estimated 20.3 million tons in 1974 to 21 million tons in 1975 and to 24 million tons in 1980. East Germany and Bulgaria are the major importers of Soviet coal and coke in the CMEA group of countries.

Soviet exports of coal and coke by country of destination in 1973 and 1974 are presented in tables 11 and 12.

**Table 11.—U.S.S.R.: Exports of coal by country of destination in 1973 and 1974**
(Thousand metric tons)

| Country | 1973 | 1974 |
|---|---|---|
| Bulgaria | 5,699 | 5,943 |
| East Germany | 3,737 | 4,119 |
| Czechoslovakia | 2,678 | 2,749 |
| Japan | 2,827 | 3,234 |
| Italy | 1,846 | 1,640 |
| Poland | 1,154 | 1,184 |
| France | 1,065 | 1,553 |
| Yugoslavia | 1,116 | 1,418 |
| Austria | 771 | 769 |
| Egypt | 422 | 455 |
| Finland | 534 | 500 |
| Denmark | 398 | 321 |
| Romania | 650 | 514 |
| Sweden | 377 | 527 |
| North Korea | 269 | 228 |
| Hungary | 355 | 322 |
| Belgium | 329 | 389 |
| West Germany | 100 | 242 |
| Greece | 44 | 82 |
| Others | 129 | 111 |
| Total | 24,500 | 26,200 |

Source: Vneshnyaya torgovlya S.S.S.R. za 1974 god (Foreign Trade of the U.S.S.R. for 1974), Moscow. 1975, p. 72.

Table 12.—U.S.S.R.: Exports of coke by country of destination in 1973 and 1974
(Thousand metric tons)

| Country | 1973 | 1974 |
|---|---|---|
| Romania | 1,332 | 1,175 |
| East Germany | 1,077 | 1,036 |
| Hungary | 638 | 656 |
| Finland | 603 | 597 |
| Bulgaria | 294 | 294 |
| Sweden | 225 | 170 |
| North Korea | 122 | 106 |
| Others | 519 | 566 |
| Total | 4,810 | 4,600 |

Source: Vneshnyaya torgovlya S.S.S.R. za 1974 god (Foreign Trade of the U.S.S.R. for 1974), Moscow. 1975, p. 72.

*Imports.*—Imports of coal and coke increased from 7 million tons in 1956 to 10.4 million tons in 1974. Poland is the only exporter of coal and coke to the U.S.S.R. Some of the reported imports of Polish coal and coke may not be shipped to the U.S.S.R. but be just credited to Soviet accounts for shipment to East Germany and other countries. In 1975, some 10 million tons of coal and about 1 million tons of coke are expected to be imported by the U.S.S.R. In 1980, some 12 million tons of coal and about 1 million tons of coke are likely to be imported by the Soviets from Poland.

Soviet coal and coke statistics are presented in table 13.

Table 13.—U.S.S.R.: Coal and coke statistics
(Million metric tons)

| | Actual | | | | Estimated | |
|---|---|---|---|---|---|---|
| | 1960 | 1965 | 1970 | 1974 | 1975 | 1980 |
| Coal: | | | | | | |
| Domestic output: | | | | | | |
| Run-of-mine coal [1] | 509.6 | 577.7 | 624.1 | 684.0 | 700.0 | 805.0 |
| Clean coal [2] | 306.0 | 331.0 | 357.0 | 392.0 | 400.0 | 460.0 |
| Imports from centrally planned economy countries [3] | 4.7 | 6.7 | 7.1 | 9.7 | 10.0 | 12.0 |
| Exports: | | | | | | |
| Centrally planned economy countries | 8.2 | 15.2 | 14.8 | 16.5 | 17.0 | 19.0 |
| Market economy countries | 4.1 | 7.2 | 9.7 | 9.7 | 10.0 | 11.0 |
| Total | 12.3 | 22.4 | 24.5 | 26.2 | 27.0 | 30.0 |
| Apparent consumption: | | | | | | |
| Run-of-mine coal [1] | 502.0 | 562.0 | 606.7 | 667.5 | 683.0 | 787.0 |
| Clean coal [2] | 298.4 | 315.3 | 339.6 | 375.5 | 383.0 | 442.0 |
| Coke: | | | | | | |
| Domestic output: | 56.2 | 67.5 | 75.4 | 83.0 | 86.0 | 95.0 |
| Imports from centrally planned economy countries [3] | .7 | .7 | .7 | .7 | 1.0 | 1.0 |
| Exports: | | | | | | |
| Centrally planned economy countries | 2.2 | 2.8 | 3.2 | 3.6 | 4.0 | 5.0 |
| Market economy countries | .4 | 1.0 | 0.9 | 1.0 | 1.0 | 1.0 |
| Total | 2.6 | 3.8 | 4.1 | 4.6 | 5.0 | 6.0 |
| Apparent consumption | 54.3 | 64.4 | 72.0 | 79.1 | 82.0 | 90.0 |

[1] Run-of-mine coal as reported in Soviet sources.
[2] Clean coal, estimated in accordance with Western practice and experience.
[3] None from market economy countries.

Source: Production data for 1960, 1965, and 1970 taken from the National Economy of the U.S.S.R., Moscow, 1960, 1965, and 1970; trade data from Foreign Trade of the U.S.S.R., Moscow, 1960, 1965, 1970, and 1974.

*Health and Safety.*—While the U.S.S.R. does not publish statistical data on injuries in the coal industry, available Soviet information reveals that there are many fatal injuries. In 1970, fatal injuries occurred at 45% of the Soviet coal mines.[31] There were at least three coal (methane) ex-

[31] Bezopasnost' truda v promyshlennosti (Labor Safety in Industry), Moscow. No. 3, March 1971, p. 4.

plosions in 1966; four in 1967; five in 1968; and four explosions in 1969.[32]

For many years a large share of the accidents (35% to 40%) occurred at production and developmental faces as a result of roof falls. The second largest group (17% to 25%) occurred during underground haulage. The third group (7% to 10%) consisted of accidents caused by machines and electricity. Finally, accidents which occurred in blasting or in handling explosives form the fourth group.

Accidents caused by roof falls at production and developmental faces are the result of inadequate support, caused mainly by shortages of props.[33] The neglect of proper roof control in mining steep coal seams of large- and medium-sized thicknesses at mines in the Prokopyevsk Region of the Kuznetsk Basin resulted in an increase in the number of fatal accidents caused by workers falling into the discharge openings where the shield system of mining was followed.[34]

The accumulation of dust in underground coal mines of the Soviet Union is high and often exceeds the safety and health standards.[35]

The administration of coal mines, with the approval of the trade union, has often used overtime to fulfill planned quotas of coal production, has sometimes required miners to work two to three shifts in succession, and has even required underground miners to work an 8-hour instead of a 6-hour shift in violation of the labor law.[36]

**Natural Gas.**—The country produced 261 billion cubic meters of usable gas, about 11% more than in 1973, but below the original 1974 plan target of 280 billion cubic meters. Of this quantity, about 99% consisted of natural gas and oil-associated gases and over 1% was gas from gasification of coal and oil shale. In 1974, gas accounted for 20.6% of the U.S.S.R. primary energy production. About 68% of the total was produced in the European part of the U.S.S.R., including over one-fifth in the Ukraine. There were about 4,500 producing wells in 1974, but 15% to 20% of them were idle.

The Ministry of Construction of the Enterprises of the Oil and Gas Industry did not fulfill plans for development of oilfields and gasfields and construction of gas pipelines and compressor stations.[37] Targets were not met by more than one-quarter of the drilling crews. Losses of time in drilling as a result of idleness and accidents amounted to 20% and in the Turkmenia and Orenburg associations, they were running above 30%.[38]

According to the 1975 plan, extraction of natural gas was expected to reach 285 billion cubic meters. The plan calls for the laying of 6,000 kilometers of trunk gas pipeline, completion of 50 new compressor stations, and start of work on the second stage of the 15-billion-cubic-meter Orenburg gas complex for processing high-sulfur natural gas; it is planned to increase extraction of sulfur at this complex from 270,000 tons in 1974 to 451,000 tons in 1975. The 1975 plan envisages 2.9 billion rubles of total investments in the development of the Soviet gas industry, or 16% more than in 1974.

The 1975 planned targets in the main gas-producing regions, in billion cubic meters, are given in the following tabulation:

| | |
|---|---|
| Ukraine (natural gas) | 57.5 |
| Turkmenia | 47.5 |
| Uzbekistan | 36.2 |
| Tyumen' | 34.5 |
| Orenburg | 17.4 |
| Komi A.S.S.R. | 17.2 |
| Stavropol' | 10.5 |
| Ukraine (associated gas) | 9.7 |
| Kaspian (offshore associated gas) | 7.9 |
| Kuban' | 5.5 |
| Mangyshlak (associated gas) | 4.5 |
| Tatar A.S.S.R. (associated gas) | 4.4 |
| Others | 32.2 |
| Total | 285.0 |

*Exploration and Reserves.*—In 1974, there were over 650 gas, gas condensate, and gasfields and oilfields in the U.S.S.R. At yearend 1974, according to Soviet estimates, natural gas reserves in categories $A+B+C_1$ (measured, indicated, and inferred reserves in place) reached 20 trillion cubic meters. About 80% of the gross re-

[32] Bezopasnost' truda v promyshlennosti (Labor Safety in Industry), Moscow. No. 3, March 1971, p. 11.
[33] Bezopasnost' truda v promyshlennosti (Labor Safety in Industry), Moscow. No. 7, July 1973, p. 2.
[34] Bezopasnost' truda v promyshlennosti (Labor Safety in Industry), Moscow. No. 11, November 1973, p. 30.
[35] Sovetskiy shakhter (Soviet Miner), Moscow. No. 7, July 1973, p. 7.
[36] Literaturnaya gazeta (Literary Gazette), Moscow. July 25, 1973, p. 1.
[37] Stroitel'stvo truboprovodov (Pipeline Construction). No. 1, January 1975, p. 2.
[38] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 17, April 1975, p. 2.

serves of gas in the Soviet Union are found in Western Siberia and Central Asia. Some 13.4 trillion cubic meters of gross gas reserves, or 67% of the total gross reserves, are in 17 fields. The major gross gas reserves, 12.6 trillion cubic meters, are in Siberia, including 11.8 trillion cubic meters in Tyumen' Oblast'; the European part of the Soviet Union contains about 3.7 trillion cubic meters; and Central Asia contains about 3.7 trillion cubic meters of gas. There are eight gas and gas-condensate fields with total gross reserves of 200 billion cubic meters.

Development of the gas industry in the near future will continue to be based on gas reserves contained in the largest and large-sized fields. However, in the European part of the U.S.S.R. the smaller fields are being used in addition to major ones.

In addition to the Shebelinskoye, Gazli, Achakskoye, and North Stavropol'skoye fields that are now being exploited, there are 36 other large gas and gas-condensate fields; of these only the Vuktyl, Medvezh'ye, Naip, and Western Krestischenskoye Fields are being exploited on an experimental-commercial basis. The largest fields of Tyumen' Oblast' are Urengoyskoye Yamburgskoye, and Arkticheskoye.

In Central Asia, the Shaltyk Field has been prepared for exploitation, its gross gas reserves exceed 1 trillion cubic meters. Gas production at this field in the near future should be raised to 32 billion cubic meters per year. In 1975, the Naip Field will be put into operation on an experimental commercial basis. This field has gross gas reserves of about 200 billion cubic meters.

In the European part of the Soviet Union, west of the Urals, the large Orenburg and Vuktyl Fields have been discovered and opened up in recent years. Gas reserves in the Orenburg Fields (categories $A+B+C_1$) are estimated at 1.66 trillion cubic meters. Gross gas reserves of the Vuktyl Field (same categories) amount to 364.2 billion cubic meters. In the eastern part of the Ukraine, near Shebelinka Field, the Western Krestishchenskoye (gross reserves 180 billion cubic meters), Yefremorskoye (60 billion cubic meters), the Melikhovskoye, and other fields have been developed.

A base for gas production has been set up in the mouth of the Yenisey River. Exploitation has begun on the Messoyakhskoye Field; in addition, discoveries have been made of the Soleninskoye, Pelyatkinskoye, Kazantsevskoye, Ozernoye, and Sazunskoye Fields.

More than 80% of gross gas reserves that have been discovered are at depths extending to 3,000 meters.

*Gasfields.*—The 1974 planned extraction of gas by major areas, in billion cubic meters, was as follows:

| | |
|---|---|
| Ukraine | 57.5 |
| Turkmenistan | 37.2 |
| Uzbekistan | 36.0 |
| Tyumen' Oblast' | 23.0 |
| Komi A.S.S.R. | 16.3 |
| Orenburg | 12.6 |

The Ukraine continued to occupy first place in the production of gas. Thirty-four gasfields were in operation, including Shebelinka and Efremovka. The Shebelinka gasfield contains about 0.5 billion cubic meters of gas and has 571 wells. Turkmenia was the second largest gas-producing region. Six gasfields were being exploited in this republic in 1974. The first stage (32 wells) of the Shatlyn gas condensate-field in Turkmen S.S.R. was commissioned in June, and development of the second stage began in July.

Uzbekistan with an output of 36 billion cubic meters was the third largest gas-producing region. The establishment and development of the gas industry in Uzbek S.S.R. are connected with the exploitation of the Gazli Field. The extraction of natural gas in Tyumen Oblast', where more than 70% of the country's gross reserves are located, is planned at 34.5 billion cubic meters, or 11.5 billion cubic meters over that of 1974. The first gas-producing well was put into service in the Urengoy area in December. The plan for development of this field calls for drilling 70 wells in the southern part of the field and for annual production of 30 billion cubic meters of gas.

*Transportation.*—The total length of trunk gas pipelines increased from 83,500 kilometers in 1973 to 98,600 kilometers at yearend 1974. About 5,100 kilometers of transmission gas pipelines were built. Completion of 6,000 kilometers of gas trunk pipelines is planned for 1975. Completed was the 2,500-kilometer Tyumen' Oblast'-Center line, a number of new sectors of the Central Asia-Center, and other gas-lines.

*Gas Processing.*—The utilization of associated gas continued to be low, especially in West Siberia, Mangyshlak Peninsula, and Turkmen S.S.R., because construction of gas refinery plants, compressor stations, and main gaslines to transport the gas has been slow. The 1971–75 5-year plan called for commissioning of facilities to refine 12 billion cubic meters of associated gas per year; however, facilities for refining only 3.2 billion cubic meters were commissioned during the 1971–74 period.

The capacity of gas-processing plants increased from 6.6 billion cubic meters per year in 1966 to over 14 million cubic meters in 1975. There were 17 associated gas-processing plants in operation. With the assistance of French firms, the first stage of the Orenburg gas-processing plant, with an annual capacity of 15 billion cubic meters, was put into service in July. One-hundred and fifty developmental wells were drilled, and three installations for gas refining, with an annual capacity of 5 billion cubic meters each, and other facilities were built. Seven hundred million rubles has been invested since the start of construction. For the first time in the U.S.S.R., the Orenburg gas refinery began the production of sulfur. The second stage of this plant was under construction in 1974.

The following associated gas-processing plants were under construction in 1974: Nizhnevartovsk No. 1 and No. 2, Yuzhno-Balyk, and Pravdinsk in Tyumen' Oblast'; Kazakhskiy No. 1 and No. 2 in Mangyshlak Oblast'; Groznyy No. 2 in North Caucasus; Belorusskiy in Gomel' Oblast'; Gnedintsevskiy in the Ukraine; and Permskiy No. 2 in the city of Perm'.

*Underground Gas Storage.*—On January 1, 1975, the total volume of 20 underground storage facilities was about 20 billion cubic meters, 10 billion cubic meters of which were under exploitation. The Potoratskoye underground gas storage facility near Tashkent was filled in November. About 1 billion cubic meters of gas was pumped into it from the Bukhara-Tashkent—Alma-Ata pipeline for use during winter. Development of underground storage facilities lagged behind goals foreseen in the 1971–75 5-year plan.

*Consumption.*—More than 50% of the natural gas extracted was utilized for industrial purposes, 26% was used for power generation, and 12% was consumed by households.

Natural gas became of considerable significance in metallurgy, machine-building, metal working, and construction materials industry. The share of gas in the total fuel consumption, in percent, was as follows: Pig iron production, 12; nonferrous metallurgy, 14; rolled steel, 40; machine-building and metal working, 5.6; and cement industry, 61. The share of gas in the fuel balance of powerplants reached 22% in 1974, a 7.2 billion-cubic-meter increase feedstock in the production of synthetic products and nitrogen fertilizers.

*Trade.*—Exports of natural gas from the Ukraine totaled 14 billion cubic meters in 1974, a 7.2 billion-cubic-meter increase compared with those in 1973. Soviet imports of natural gas from Iran and Afghanistan increased from 11.4 billion cubic meters in 1973 to 11.9 billion cubic meters in 1974. For the first time the U.S.S.R. became a net gas exporter.

The first West European country to import Soviet natural gas was Austria. It receives gas under a 23-year agreement signed in 1968. Under an agreement signed November 29, 1974, deliveries of Soviet gas to Austria will be increased from 1.5 to 2 billion cubic meters per year for 1978–2000. The Soviet Union has two agreements (1970 and 1972) with West Germany's Rhurgas for delivery over 20 years of about 120 billion cubic meters of gas. West Germany began to receive gas through the transit pipeline in 1973. Under contract No. 3, signed on October 29, 1974, the Soviet Union will supply West Germany with 60 billion cubic meters of natural gas. Under the barter deal West Germany will supply in 1975–76 another 1 million tons of large-diameter steel pipe to the U.S.S.R. in return for an increased supply of natural gas. Deliveries of gas under the new contract will start on January 1, 1978, at a minimum 2.5 billion cubic meters per year. Like the present deliveries, the additional supplies will be routed through Czechoslovakia. From 1980 at least 10 billion cubic meters will be supplied annually. Total deliveries from 1973 to yearend 2000 will amount to over 200 billion cubic meters.

In 1974, Italy joined the group of West European importers of Soviet natural gas. The Soviet-Italian gas pipeline was completed in April and Soviet gas reached Italy on May 1, 1974. The line was built on the basis of an agreement signed in December 1969. The capacity of the pipe-

line is to reach 13 billion cubic meters by 1975. In 1974, Italy received 790 million cubic meters of gas. Over the 1975–76 period the volume of deliveries to Italy will grow and will reach 6 billion cubic meters per year. From 1977, 6 billion cubic meters of Soviet gas will be sent annually to Italy under a 20-year agreement.

Deliveries of Soviet gas to Finland under the 20-year agreement started in 1974. During the first year of supplies, 443 million cubic meters were exported, and this will subsequently be raised to 1.4 billion cubic meters per year.

The Soviet Union is continuing its negotiations with Gaz de France for the delivery of natural gas to France through the international pipeline over 20 years (starting in 1976) of 2.5 billion cubic meters per year.

The Soviet Union intends to further increase its deliveries of natural gas to West European countries. For this purpose a second pipeline will be constructed along the existing right-of-way of the present international gasline and four new compressors and five distribution sections will be built. It is expected that the yearly throughput capacity of the pipeline will reach 28 billion cubic meters by 1978. This will also permit increased deliveries of gas to Czechoslovakia and the beginning of supply of gas to Yugoslavia.

Discussion on exploration and shipment of Yakutsk natural gas to Japan and the United States continued in 1974. An agreement of cooperation in geological prospecting in the Yakut gasfield was signed on November 22, 1974. Reportedly, a new Soviet-Swedish economic agreement was to be signed in 1975. The U.S.S.R. had agreed to supply yearly 1 billion cubic meters of natural gas to Sweden until the year 2000, but Sweden has declined the Soviet offer of natural gas.

According to an agreement, Bulgaria, Hungary, East Germany, Poland, and Czechoslovakia will build the Orenburg-Eastern Europe gas pipeline. The 1,420-millimeter-diameter pipeline will be 2,750 kilometers long. Its route has been divided into five sections: Urals, Volgograd, Kharkov, Cherkasky, and Ivano-Frankovsk. Work on each section will be carried out by one of the COMECON countries. The first section, from Orenburg to Aleksandrov Gay (Urals), 550 kilometers, is to be laid by Poland. The maximum number of Polish workers to be employed on the project at any time will be 7,000. The second section, the Volgograd, from Aleksandrov Gay to Sokhranovka (560 kilometers) across the Volgograd and Rostov area, will be built by 6,000 Czechoslovakian workers. The Khar'kov section (595 kilometers) will cross the territory of Rostov, Voroshilovgrad, Khar'kov and Poltava Oblast's and will be built by some 4,000 Hungarian workers. The fourth (Cherkassy) section (550 kilometers), to be built by East Germany, begins south of Kiev and runs in an east-west direction as far as Vinnitsa on the river Bug. The last section (Ivan-Frankovsk) across the Carpathians will be built by Bulgaria.

The U.S.S.R. will make geological surveys of route lines and will also provide all technical documentation, technical training of personnel, and housing for East European workers. Construction of this trunk pipeline will start in 1975. The whole pipeline should be in service by the third quarter of 1978 and by 1980 it will be supplying the U.S.S.R. and East European countries with 15.5 billion cubic meters of gas per year. The Soviet Union will repay five COMECON nations through deliveries of natural gas over 12 years. Romania will provide hard currency for purchase of equipment and other materials in the West.

An agreement on long-term exports of Soviet natural gas to Yugoslavia was signed at the end of 1974. The delivery of gas via Hungary should begin in 1976.

Exports of natural gas increased in 1974 compared with those in 1973 and were as follows, in billion cubic meters:

| Country | 1973 | 1974 |
|---|---|---|
| Czechoslovakia | 2.4 | 3.2 |
| Poland | 1.7 | 2.1 |
| West Germany | .4 | 2.1 |
| Austria | 1.6 | 2.1 |
| Italy | -- | .8 |
| Finland | -- | .4 |
| Bulgaria | -- | .3 |
| Unknown | .7 | 3.0 |
| Total | 6.8 | 14.0 |

**Petroleum.**—In 1974, the Soviet Union produced 459 million tons of crude oil and gas condensate, a 7% increase that put the U.S.S.R. first in production for the first time. Soviet crude and petroleum product exports declined slightly, from 118.3 million tons in 1973 to 116.2 million

tons in 1974. Imports of crude oil and products dropped sharply from 14.7 million tons to 5.4 million tons for the same period. The U.S.S.R. was again a large exporter of crude oil and products with 27.5% of the total production. The share of petroleum in the U.S.S.R.'s total fuel production (30.5% in 1960, 35.8% in 1965, and 41.1% in 1970) is increasing steadily and reached an estimated 44% in 1974.

In 1974, over 500 (including 36 large) oil and gas condensate fields were in operation, with a total of over 61,000 wells. Increased production came mainly from West Siberia, where 16 oilfields were producing in 1974. West Siberia now has 98 oilfields, the largest of which is Samotlor. Production in this region began in 1965 and reached 89 million tons in 1973 and 116 million tons in 1974. The goals for 1975 are set at 146.5 million tons and in 1980 the output is to reach 230 to 260 million tons.

Late in 1974, the U.S.S.R. increased the price of petroleum sold to other centrally planned economy countries by about 2.4 times.

Soviet petroleum production is increasing regularly by some 7% per year and will reach 490 million tons by 1975 and some 640 million tons by 1980. The greatest increment in petroleum production is foreseen in Western Siberia, Mangyshlak Peninsula in Kazakhstan, Komi A.S.S.R., and Udmurt A.S.S.R. Twelve out of 26 petroleum regions are to increase production. However, 14 regions will reduce production. The greatest drop in production will occur in North Caucasus, Ukraine, Kuybyshev Oblast', and the Lower Volga region.

It is planned to drill more than 8.5 million meters of wells, to put 4,300 new developmental oil wells into operation, and to lay 2,700 kilometers of oil pipeline in 1975. Capital investment is to rise during 1975 to 9% over that of 1974, reaching 2.7 billion rubles; the volume of construction-installation work should reach 1.7 billion rubles, an increase of 17%. Facilities with the following capacities are to be commissioned among others during the 1975 year: Crude oil collection, 87.2 million tons; crude oil preparation, 69 million tons; and petroleum pipelines, 2,750 kilometers.

Reportedly, the Soviet Oil Industry Minister has proposed to American companies technical cooperation in the field of exploration and oil extraction using new methods and techniques. He also stressed that oil companies from any country could take part and the U.S.S.R. is ready to pay for this sort of cooperation.

*Exploration and Reserves.*—A total of over 3 billion rubles was allocated for geological exploration in 1974, 8% more than 1973. About 52% of all funds was for oil and gas exploration. Over 2,500 geological and geophysical teams are permanently employed in the prospecting and exploration of oilfields and gasfields. Drilling footage for oil and gas increased from 13.6 million meters in 1973 to about 14.5 meters in 1974. About 42% of the total wells were exploratory. In 1974, a total of over 4,400 oil-producing wells were completed. The prospecting for oilfields and gasfields was strengthened in the Komi A.S.S.R., Orenburskaya and Permskaya Oblasts, the Volga region, the Ukraine, Belorussia, the Caspian Offshore Shelf, and the petroleum and gas regions of the North Caspian region. About 40% of oil industry investment was spent on drilling.

Depletion of shallow oilfields and gasfields is pressing the Soviet drilling industry to upgrade its drilling technology to the level attained in the West. As result of this, the U.S.S.R. has been purchasing technology and equipment from the United States, Western Europe, Canada, and Japan. In 1974, there were some serious shortcomings in the performance of drilling operations and a large number of wells in potential regions were never drilled to the projected depths.[39]

*Oilfields and Crude Oil Production.*—In 1974, oil was produced in a number of separated regions, of which the Volga-Urals area was most important. West Siberia was the second largest producer followed by the North Caucasus, Kazakhstan, Turkmenistan, Azerbaydzhan, Ukraine, and Belorussia.

Tyumen Oblast', where 14 oilfields were in operation, replaced Tatar A.S.S.R. as the Soviet Union's leading crude producer in 1974. The Samotlor oilfield in this Oblast, the largest oilfield in the U.S.S.R., accounted for 50% of the oil extracted in

[39] Neftyanik (Oil Man), Moscow. No. 10, October 1974, pp. 1–3.
Neftyanoye khozyaystvo (Oil Economy), Moscow. No. 4, April 1974, pp. 62–66.

West Siberia. Plans call for an extraction rate of 100 million tons per year at this oilfield by 1977. About 1,000 developmental wells were put into operation in West Siberia, where 50,000 people were employed in 1974. Development of the Ust'-Balyk oilfield was continuing.

Production of crude oil in West Siberia in 1971–75, in million tons, was as follows:

| | | |
|---|---|---|
| 1971 | 44.8 | |
| 1972 | 62.7 | |
| 1973 | 87.7 | |
| 1974 | 116.4 | |
| 1975 | 146.1 | (planned) |

The Tatar A.S.S.R., which for the first time produced 103.5 million tons of crude oil in 1974, became the second largest crude producer. The oil of this region is the cheapest in the Soviet Union. The Romashkino oilfield is the largest in Tatar A.S.S.R. Growth in petroleum production in Tatar A.S.S.R., in million tons, was as follows:

| | |
|---|---|
| 1960 | 46.3 |
| 1965 | 79.7 |
| 1970 | 101.9 |
| 1974 | 103.5 |

The Bashkir A.S.S.R. contributed 40 million tons of crude in 1974; some 690 developmental wells were put into operation. The Udmurt A.S.S.R. had the second (after West Siberia) fastest growth rate for crude production in the U.S.S.R. For the first time, Perm Oblast' extracted 20 million tons of crude in 1974.

The output of crude in Kazakhatan increases from year to year. The largest reserves are on the Mangyshlak Peninsula. Up to 1975, nine oilfields, of which five were already supplying crude oil, were surveyed. The largest oilfield is Uzen', which produced some 13 million tons of the republic's total which was over 20 million tons. More than 200 new developmental wells were put into production in Kazakhstan in 1974.

About 170 developmental wells in Belorussia produced 7.8 million tons of crude in 1974. For several years oil production on Sakhalin Island was held at about 2.4 million tons per year.

Chechon-Ingush A.S.S.R., Kazash S.S.R., Ukrainian S.S.R., and several other regions did not meet crude oil production quotas during 1971–74.

Shifts in Soviet actual and planned production of crude oil are shown in table 14.

**Table 14.—U.S.S.R.: Production of crude oil by region in selected years from 1940 through 1975**
(In percent)

| Region | Actual | | | | Planned | |
|---|---|---|---|---|---|---|
| | 1940 | 1950 | 1960 | 1965 | 1970 | 1975 |
| R.S.F.S.R | 22.6 | 48.0 | 80.4 | 82.3 | 80.7 | 80.3 |
| Volga-Urals | 5.9 | 29.1 | 70.6 | 71.5 | 59.7 | 44.7 |
| Kuybyshev Oblast' | .7 | 9.3 | 15.1 | 13.8 | 10.0 | 6.8 |
| Bashkir A.S.S.R | 4.6 | 14.9 | 17.1 | 16.7 | 11.7 | 8.0 |
| Tatar, A.S.S.R | -- | 2.3 | 31.3 | 32.8 | 28.8 | 20.2 |
| Perm' Oblast' | .5 | .8 | 1.5 | 4.0 | 4.6 | 4.0 |
| Orenburg Oblast' | .1 | .6 | .9 | 1.1 | 2.1 | 2.8 |
| Volgograd Oblast' | -- | -- | 3.2 | 2.4 | 2.0 | 1.5 |
| North Caucasus | 14.8 | 16.0 | 8.2 | 8.5 | 9.7 | 7.4 |
| Chechen-Ingush A.S.S.R | 7.2 | 6.4 | 2.2 | 3.7 | 5.8 | 4.5 |
| Komi, A.S.S.R | .2 | 1.4 | .5 | .9 | 1.6 | 2.4 |
| West Siberia | -- | -- | -- | -- | 9.0 | 25.2 |
| Ukrainian S.S.R | 1.1 | .8 | 1.5 | 3.1 | 3.8 | 3.3 |
| Belorussian S.S.R | -- | -- | -- | .15 | 1.2 | 1.7 |
| Kazakh S.S.R | 2.2 | 2.8 | 1.1 | .8 | 3.7 | 6.0 |
| Azerbaydzhan S.S.R | 71.4 | 39.2 | 12.1 | 8.9 | 5.7 | 3.8 |
| Uzbek S.S.R | .4 | 3.1 | 1.1 | .7 | .5 | .3 |
| Turkmen S.S.R | 1.9 | 5.3 | 3.6 | 4.0 | 4.1 | 4.4 |
| Others | .4 | .8 | .2 | .1 | .3 | .2 |
| Total U.S.S.R | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: Ekonomika neftyanoy promyshlennosti (Economics of Oil Industry), Moscow. No. 8, August 1973, p. 7.

*Offshore Production.*—Several offshore fields have been developed in the Caspian Sea off Azerbaydzhan. The "Neftyanye Kamni" (Oil Stones) Field is 20 to 25 kilometers from the coast and the largest in Azerbaydzhan. From steel trestles, which cover a distance of more than 200 kilometers, more than 1,000 wells have been drilled. These wells produced one-third of the total crude production in Azerbaydzhan in 1974. Drilling platforms were installed at water depths of 10 to 25 meters, and construction of platforms for wells at depths of 25 to 30 meters continued in the northeast region of Neftyanye Kamni. In 1974, about two-thirds of the crude oil (11.5 million tons) and three-fourths of the natural gas (8 billion cubic meters) produced in Azerbaydzhan came from offshore fields.

Offshore oil was also produced from several wells in Turkmenistan, where several oilfields have been found offshore recently. Development of Zhdanov and Lam Fields in this republic continued in 1974. Reportedly, a promisory offshore oilfield has been discovered in the western part of the Azov Sea. The first offshore oilfield in the Baltic Sea was discovered after 2 years of prospecting in Kurskiy Bay. Drilling of exploratory wells continued in the Black Sea. A small steel platform designed in Baku is to be set up in the Sea of Okhotsk near Okha to search for offshore oil. The platform will be assembled at the shore and towed out to its site, in a 15 meter-deep part of the sea. According to Soviet sources, offshore oilfields are situated not only in the Caspian Sea but also in the Black, Azov, Baltic, and Okhotsk Seas and in the Arctic Ocean.

During 1971–75, almost 780,000 meters are to be drilled offshore in Azerbaydzhan. The depths of wells are constantly increasing and by the end of the ninth 5-year plan depths should exceed 5,000 meters. According to Soviet calculations, 60% to 65% of the predicted reserves of oil and gas in Azerbaydzhan are offshore.

In 1967, the floating platform "Apsheron" began drilling the first deep, 1,800-meter well near the Savenko bank. Water depths in this region of the Caspian Sea reach 13 to 14 meters. In 1968, a floating rig, the Khazar, built in the Netherlands to Soviet specifications, was put into drilling operation in the Caspian Sea where the water depth is not more than 60 meters. The equipment was built for drilling to a depth of 6,000 to 7,000 meters. The floating drilling platform, the Azerbaydzhan, completed in December 1971, can drill wells to a depth of 3,000 meters in water of up to 20 meters deep. A new floating drilling rig, Kaspiy, designed in Baku (probably a copy of the Khazar rig) and built at the Krasnye Barrikady shipyard in Astrakhan became operational in the Caspian Sea in October 1974. It is capable of drilling a 6,000-meter well where the depth of the sea is 60 meters. The Kaspiy is the first of a series of 10 such rigs, which will be constructed in the future. Construction of the second unit to operate in the Black Sea was started in 1974. Negotiations on joint exploration of offshore oilfields adjacent to the Sakhalin Island, between the U.S.S.R. and United States and Japanese firms continued in 1974.

*Refining and Petroleum Product Supply.*—The 1971–75 5-year plan envisages an increase in product output in 1975 by 1.4 times as compared with 1970. However, the planned 1971–74 goal was not met. Information pertinent to refining and utilization of petroleum products is secret and material on the subject is not easily accessible. However, a great deal of indirect information is available. Soviet crude oil is treated both at field plants and at refineries. However, the problem of preparing crude for refining has not been solved. The crude obtained at field dewatering installations contains up to 1.5% water (average 0.76%) and up to 5,000 milligrams of chloride salts per liter (average 739 milligrams) while the norms permit only 0.2% water and 40 milligrams of salt per liter.[40] As a result, according to Soviet sources, refinery consumption and losses amount to 13.4%.[41] The total loss incurred by refining insufficiently desalinated crude oil is more than 200 million rubles per year.[42] Losses in storage and transportation of crude oil to refineries are estimated at 1.6%. While the Soviets do not report output figures for petroleum products, good estimates can be derived, however, by applying to reported crude pe-

[40] Khimiya i tekhnologiya topliv i masel (Chemistry and Technology of Fuels and Lubricants), Moscow. No. 8, August 1972, pp. 1–5, and No. 1, January 1975, pp. 1–6.
[41] Promyshlennaya energetika (Industrial Power Engineering), Moscow. No. 2, February 1968, p. 3.
[42] Sotsialisticheskaya industriya (Socialist Industry), Moscow. June 3, 1970, p. 1.

troleum input a factor of 85%. Thus, Soviet output of refined products from crude oil (including condensate) in 1974 has been estimated at 326 million tons. Approximately 80 refineries were in operation, with a total estimated capacity as of January 1, 1975, of 362 million tons. Based upon production and trade figures, Soviet consumption of refined products in 1974 has been estimated at 290 million tons. The utilization of petroleum in the Soviet chemical industry reached not more than 3% of the total crude production, and the utilization of natural gas reached less than 7%.

Since the beginning of the present 5-year period, the average capacity of the Soviet Union's oil refineries has increased 24%.[43] The renovation and enlargement of existing refineries, in addition to the construction of new ones, forms the basis of Soviet petroleum technological policy. Obsolete installations of low productivity are being replaced by "combined blocks," mainly from Western countries, that merge several processes and are able to refine 6 million to 8 million tons of crude per year. Litwin S.A., French subsidiary of Amtel, Inc., will build a petrochemical complex at Shevchenko in Kazakhstan. The project, which will be built in 4–5 years will have an installed value of $220 million. The complex will consist of five plants. UOP has signed a contract with the Soviet Licensintorg for the design and supply of equipment for three oil processing units for refineries in the U.S.S.R. In 1974, new capacities for primary processing of oil and catalytic reforming were put into operation at Novokuyubyshev, Angarsk, and Omsk complexes and at Kirishi, Kremenchung, Polotsk, Novo-Ufimsk, and Groznyy imeni Sheripova refineries.

*Transportation.*—About one-half of the total tonnage of crude oil and refinery products moved in the U.S.S.R. in 1974 was shipped by rail. The total length of crude oil and petroleum product trunk pipelines, as of January 1, 1974, totaled over 47,000 kilometers, and the average distance of pipeline deliveries in 1973 was about 900 kilometers. Only about 70% of total pipeline capacity was utilized. The network of crude oil and petroleum product lines increased an estimated 5,300 kilometers in 1974. The recent growth in estimated total length of crude oil and petroleum product trunk pipelines is shown, in thousand kilometers, in the following tabulation:

| Year | Crude pipelines | Product pipelines | Total |
|---|---|---|---|
| 1970 | 31.6 | 5.8 | 37.4 |
| 1971 | 34.5 | 6.5 | 41.0 |
| 1972 | 35.4 | 7.5 | 42.9 |
| 1973 | 39.2 | 8.0 | 47.2 |
| 1974 | 44.2 | 8.3 | 52.5 |
| 1975 (plan) | 46.9 | 8.5 | 55.4 |

Among the most important pipelines constructed in 1974 were the 1,490-kilometer, 820-millimeter Kuybyshev-Tikhoretsk-Novorossiysk crude pipeline; the 1,135-kilometer, Ukhta-Yaroslavl crude pipeline; and the 232-kilometer Khashuri-Batumi product pipeline. Construction of the 2,250-kilometer, 1,220-millimeter Samotlor-Kuybyshev crude pipeline started in 1974.

The largest Soviet crude pipeline is the "Druzhba" with a total two-line length of 9,310 kilometers, of which 6,950 kilometers are located in Soviet territory. This pipeline delivers crude from Tataria, Kuybyshev, and West Siberia to Czechoslovakia, Poland, Hungary, and East Germany. During recent years a number of crude trunk lines have been built including the 1,920-kilometer Samotlor-Almetyevsk and the 800-kilometer Alexandrovskoye-Anzhero-Sudzhensk.

The first large Soviet-built tanker, the 182,000-ton *Krym,* successfully completed trial runs in the Black Sea in 1974. This tanker is 2.5 times larger than the *Sofiya* type of tankers.

*Trade.*—Soviet exports of crude oil and petroleum products totaled 116.2 million tons in 1974, a 1.8% decrease compared with those in 1973, comprising 80.6 million tons (68%) of crude oil and 35.6 million tons (32%) of oil products. Over 61% of total exports of crude oil and petroleum products (71.7 million tons) were shipped to centrally planned economy countries. The balance (44.5 million tons) went to market economy countries. The U.S.S.R. exported more than one-fourth of its production in 1974. In 1974, as payment for various supplies, the U.S.S.R. received 4.4 million tons of crude oil (including 3.9 million tons from Iraq and 0.2 million tons from Egypt) and 1 million tons of petroleum products, mainly from Romania.

[43] Pravda, Moscow. July 23, 1974.

Soviet exports of crude and petroleum products by country of designation in 1974, in thousand tons, are as follows:

| | |
|---|---|
| Czechoslovakia | 14,836 |
| East Germany | 14,424 |
| Poland | 11,855 |
| Bulgaria | 10,855 |
| Finland | 9,173 |
| Cuba | 7,643 |
| Italy | 6,788 |
| Hungary | 6,729 |
| West Germany | 6,340 |
| Yugoslavia | 3,790 |
| Sweden | 3,027 |
| Netherlands | 2,975 |
| Belgium | 1,752 |
| France | 1,360 |
| Spain | 1,351 |
| Japan | 1,241 |
| Greece | 1,032 |
| India | 1,009 |
| Austria | 970 |
| North Korea | 942 |
| United Kingdom | 918 |
| Switzerland | 779 |
| Denmark | 703 |
| Morocco | 647 |
| Iceland | 460 |
| Mongolia | 347 |
| Ghana | 309 |
| North Vietnam | 293 |
| Norway | 279 |
| Egypt | 229 |
| Afghanistan | 193 |
| Ireland | 118 |
| Somalia | 113 |
| Cyprus | 106 |
| Others | 2,614 |
| Total | 116,200 |

Source: Vneshnyaya torgovlya S.S.S.R. za 1974 god (Foreign Trade of the U.S.S.R. for 1974). Moscow, 1975, 314 pp.

Crude oil and product exports from the U.S.S.R. to COMECON countries will continue to grow. According to an agreement, signed December 23, 1974, supplies of petroleum from the Soviet Union to Czechoslovakia are to increase by 8.4% in 1975 to 15.5 million tons of crude and more than 0.36 million tons of products. Under a contract, signed December 6, 1974, Poland is to build a 450-kilometer oil pipeline linking Belorussia with Estonia. It will be paid for in additional deliveries of crude oil to Poland. The Soviet Union will continue to meet most of Hungary's oil requirements and in 1980 it will also deliver substantial quantities of electric power and natural gas. Reportedly, on the average the COMECON nations will be receiving 5% more crude oil from the U.S.S.R. during 1975 at unchanged prices. The price of Soviet crude to Hungary was 15.89 rubles per ton.

According to an agreement signed in February 1974 between Yugoslavia, Hungary, and Czechoslovakia, construction of the Adria crude pipeline began at yearend 1974. It is planned that crude oil, delivered from the Middle East and North Africa to the port of Rijeka, Yugoslavia, will flow to Yugoslavia, Hungary, and Czechoslovakia by 1977. Soviet petroleum statistics are presented in table 15.

**Other Fuels and Energy.**—Among the Soviet sources of fuels and energy of lesser significance in the energy economy in 1974 are hydroelectric power, nuclear energy, oil shale, peat, and fuelwood.

**Table 15.—U.S.S.R.: Salient petroleum statistics**
(Million metric tons)

| | 1960 | 1965 | 1970 | 1974 | 1975 e | 1980 e |
|---|---|---|---|---|---|---|
| Crude oil (including gas condensate): | | | | | | |
| Domestic output | [1]147.9 | [1]242.9 | [1]353.0 | 459.0 | 490 | 640 |
| Imports | [1]1.2 | -- | -- | 4.4 | 5 | 12 |
| Exports: | | | | | | |
| Centrally planned economy countries | [1]8.8 | [1]22.9 | [1]41.0 | 52.6 | 55 | 100 |
| Market economy countries | [1]9.0 | [1]21.0 | [1]26.0 | 28.0 | 28 | 30 |
| Total exports | [1]17.8 | [1]43.9 | [1]67.0 | 80.6 | 83 | 130 |
| Crude product conversion: | | | | | | |
| Crude oil to refineries | e 130.0 | e 199.5 | e 286.0 | 382.8 | 412 | 520 |
| Refinery capacity | e 153.0 | e 250.0 | e 295.0 | 362.0 | 390 | 475 |
| Refined oil: | | | | | | |
| Output from crude | e 119.0 | e 173.0 | e 243.0 | 326.0 | 350 | 443 |
| Imports | [1]3.2 | [1]1.9 | [1]1.1 | 1.0 | 1 | 1 |
| Exports: | | | | | | |
| Centrally planned economy countries | [1]6.4 | [1]6.5 | [1]9.5 | 12,6 | 13 | 16 |
| Market economy countries | [1]9.0 | [1]14.5 | [1]17.5 | 23.0 | 24 | 29 |
| Total exports | [1]15.4 | [1]21.0 | [1]27.0 | 35.6 | 37 | 45 |
| Apparent consumption | 106.8 | 153.9 | 217.1 | 291.4 | 314 | 399 |

e Estimate.
[1] Production data 1960, 1965, and 1970 taken from the National Economy of the U.S.S.R., Moscow, 1960, 1965, and 1970; trade data from Foreign Trade of the U.S.S.R., Moscow, 1960, 1965, 1970, and 1974.

*Hydroelectric Power.*—Electric power stations generated 975 billion kilowatt hours, a 6% increase over that of 1973. At yearend 1974, the total capacity of all Soviet powerplants reached 205.1 million kilowatts compared with 196.1 million kilowatts in 1973. Production of all electric power is planned to rise to 1,035 billion kilowatt-hours in 1975, 30 billion less compared with the original plan of 1,065 kilowatt-hours. There are plans to commission 12.9 million kilowatts of new electric-power generating facilities in 1975, including 7.7 million thermal, 1.4 million nuclear, and 3.8 million kilowatts hydroelectric capacity. Exports of electric power rose from 9.9 billion kilowatt-hours in 1973 to 10.9 billion kilowatt-hours in 1974, including about 9.3 billion kilowatt-hours to centrally planned economy countries and over 1.5 billion kilowatt-hours to Finland and Norway. Hungary remained the principal importer of Soviet power followed by Bulgaria, Czechoslovakia, and Poland.

Electric power generation and the capacity of Soviet electric powerplants, by type, in 1974 are shown in the following tabulation:

| Type | Capacity | | Production | |
|---|---|---|---|---|
| | Million kilowatts | Percent | Billion kilowatt-hours | Percent |
| Thermal electric | 164.6 | 80.2 | 827.0 | 84.9 |
| Nuclear | 3.7 | 1.8 | 18.0 | 1.8 |
| Hydroelectric | 36.8 | 18.0 | 130.0 | 13.3 |
| Total | 205.1 | 100.0 | 975.0 | 100.0 |

Source: Elektricheskiye stantsii (Electric Powerplants), Moscow. No. 1, January 1975, p. 3.

About 85% of all Soviet electric energy is generated at thermal powerstations fueled mainly by coal as is indicated, in percent, in the following tabulation:

| Source of fuel | 1970 | 1975 |
|---|---|---|
| Coal | 48.6 | 45.0 |
| Mazut | 23.0 | 25.6 |
| Natural gas | 23.1 | 23.4 |
| Peat, oil shale, and other | 5.3 | 6.0 |
| Total | 100.0 | 100.0 |

Source: Elektrichesniye stantsii (Electric Powerplants), Moscow. No. 1, January 1975, p. 3.

The leading role of coal in power generation is expected to continue for a long time, and the share of coal as fuel for power generation is expected to increase. Up to 75% of the solid fuel burned at the U.S.S.R.'s thermal electric powerplants has a combustion heat of 1,500 to 5,500 kilocalories per kilogram. Soviet energy production will get high investment priority during the next 5-year plan period (1976–80).

About one-half of the total capacity of hydroelectric powerstations of the U.S.S.R. is concentrated at plants with a capacity of over 1 million kilowatts. The largest operating station is the Krasnoyarsk hydraulic powerplant with a capacity of 6 million kilowatts. In 1974, 19 hydro-units were put in operation at the Ust'-Ilimskaya, Chirkeyskaya, Dneprovskaya No. 2, Rizhskaya, Kanevskaya, and Toktogul'skaya hydraulic powerplants with a total installed capacity of 1.9 million kilowatts.

Planned consumption of power, by major branches of the Soviet economy, in 1975 is shown in the following tabulation:

| Consumer | Billion kilowatt-hours | Percent of total |
|---|---|---|
| Industry | 582.0 | 56.2 |
| Construction | 20.0 | 1.9 |
| Transport | 74.4 | 7.2 |
| Agriculture and rural population | 72.5 | 7.0 |
| Domestic (urban) | 123.5 | 11.9 |
| Powerplants and losses | 151.6 | 14.7 |
| Exports | 11.0 | 1.1 |
| Total | 1,035.0 | 100.0 |

Source: Elektricheskiye stantsii (Electric Powerplants), Moscow. No. 1, January 1975, p. 3.

In the beginning of the 1960's a voltage of 660 volts was inserted in the GOST (State Standards) and found to be applicable in the mines and pits of chemical mining enterprises. But because of shortage of electric equipment adaptable to 660 volts instead of 380 only a portion of the coal mines and several potassium mining operations are using 660 volts.[44]

*Nuclear Power.*—The Soviet Union operated seven atomic powerplants with a total capacity of 2,602 megawatts, or 1.8% of the capacity of all electric powerplants in the country on January 1, 1974 (Novo-Voronezh, four reactors, total capacity 1,445 megawatts; Beloyarsk, two reactors, 300 megawatts; Melekess, one reactor, 50 megawatts; Obninsk, one reactor, 5 megawatts; Kola Peninsula, one reactor, 440 megawatts; Shevchenko, one reactor, 350 megawatts; and Bilibino, one reactor, 12 megawatts). In 1974, the following nuclear powerplants were put into operation: The first stage (one reactor) at Leningrad, with a capacity of 1,000 megawatts commissioned in January and the second stage (one reactor) of the Kola Peninsula with a capacity of 440 megawatts, completed December 31. Therefore, the total installed capacity of all eight Soviet nuclear powerplants was 4,042 megawatts or about 2% of the capacity of all electric powerplants in the U.S.S.R. on January 1, 1975.

In 1974, Soviet nuclear powerplants generated 18,000 million kilowatt-hours (54% more than in 1973), or 1.8% of all power supplied in 1974. It is planned to generate 25,000 million kilowatt-hours in 1975. Several nuclear powerplants were under construction in 1974, of which two were scheduled for completion in 1975.

Estimated levels of Soviet atomic generating capacity for 1975 and 1980 are 5,000 and 17,500 megawatts, respectively. The U.S.S.R. will probably increase the production of nuclear power from 18 billion kilowatt-hours in 1974 to 20 billion in 1975 and 65 billion kilowatt-hours in 1980. Nuclear power output is to represent about 4.7% of national electric power production and about 0.5% of total Soviet primary energy output by 1980.

The U.S.S.R. provides technical assistance in the construction of atomic powerplants in COMECON countries. A nuclear powerplant with a capacity of 70 megawatts was put into operation at Rheinsberg, East Germany, in May 1966. Reportedly, a nuclear powerplant near Greifswald on the Baltic coast was put into operation in December 1973, and the second stage of this plant was completed in December 1974.

In December 1972, the first Czechoslovakian nuclear powerplant, with a capacity of 140 megawatts, was put into operation at Yaslovske Bohunice in Western Slovakia. The second stage of this plant was under construction in 1974. The technical project on the second nuclear powerplant in Czechoslovakia, with a capacity of 440 megawatts, was completed by Soviet engineers in 1974.. The first stage (440 megawatts) of the Kozloduy nuclear powerplant in Bulgaria was completed in December 1974. Construction of similar nuclear powerplants, with a capacity of 440 megawatts each, began in Hungary (Paks nuclear powerplant) and in Romania in 1974 and were scheduled for completion by 1985. Yugoslavia's first nuclear powerplant, the Krsk plant with a capacity of 600 megawatts, was under construction in 1974 and scheduled for completion by 1985.

The first nuclear powerplant in Poland, with a capacity of 440 megawatts, is to be built on lake Zarnowieckie, Gdansk Province, during the 1990's. Cuba's first atomic powerstation is to be built in Las Villas Province with Soviet assistance.

Finland ordered two nuclear powerplants from Sweden and two from the Soviet Union. Two more plants may be ordered from the U.S.S.R. at a later date. Both of the Swedish-supplied powerplants will use uranium fuel bought from Canada and enriched by the Soviet Union. According to a long-term agreement, Spain will import an estimated $400 million worth of Soviet uranium concentrate to fuel nuclear powerplants in Spain. Reportedly, Rheinish Westfälisches Elektrizitaetswerk AG (RWE) has a contract with the Soviet Union, worth DM1,000 million (about US$392 million in 1974) and valid until 1990, that will ensure a sufficient supply of uranimum for the nuclear powerplants. The contract for the enrichment of uranium for Austria's second nuclear power project for a 12-year period was signed by the U.S.S.R. on May 23. This nuclear powerplant is scheduled to operate in 1980 or 1981.

[44] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Sept. 14, 1974, p. 2.

*Oil Shale.*—Minable oil shale reserves, confined to deposits in Estonia, Leningrad Oblast', and the Volga region, amounted to over 5 billion tons of standard fuel equivalent (16.7 billion tons). The largest oil shale reserves are in Estonia. The production of oil shale increased from 31.1 million in 1973 to an estimated 33 million tons in 1974. Output of oil shale may possibly reach 34 million tons in 1975 and 38 million tons in 1980. Over two-thirds of the extracted shale in the U.S.S.R. is burned at the Pribaltiyskay and Estonskay thermal electric powerplants. The remainder is processed into furnace oil, gasoline, fuel gas, phenols, and aromatic hydrocarbons. Oil shale is also used in commercial everyday needs. The world's biggest powerplant in Tallin fueled by oil shale has reached a capacity of 1,600,000 kilowatts.

The main center of production as in prior years, was the Estonian S.S.R. where output totaled over 27 million tons in 1974 and is expected to be 28 million tons in 1975. There were eight underground mines and four open pits in Estonia in operation in 1974. The No. 3 mine at Kiisa in this republic was put into operation in 1974. Initial output of the mine will be 1.5 million tons a year; full capacity of 5 million tons is to be reached in 1977.

*Peat.*—The Soviet Union produced an estimated 191.6 million tons of peat in 1974. Of this quantity, 60 million tons consisted of fuel peat and 131.6 million tons of agricultural peat. This last figure includes peat from collective farms, which may be used for local fuel. The Russian Soviet Federated Socialist Republic (R.S.F.S.R.) occupied first place in the production of peat in the U.S.S.R. and produced some 57% of the total. Belorussian S.S.R., with an output of about 22% of the total, was the second largest peat producing region.

Soviet gross reserves of peat were estimated at 163.2 billion tons in 1973. However, about 11% of today's minable reserves are located in the Central European part of the U.S.S.R., Belorussia, the Baltic States, and the Ukraine regions, which all together produced over 80% of the national output in 1974.

Reserves and production of peat, by Soviet Union Republic, in 1973 were as follows:

| Republic | Reserves | | Production | |
|---|---|---|---|---|
| | Billion metric tons | Percent of total | Million metric tons | Percent of total |
| R.S.F.S.R | 151.1 | 92.6 | 110.8 | 57.8 |
| Including regions: | | | | |
| North-West | 20.0 | 12.2 | 19.1 | 10.0 |
| Center | 5.2 | 3.2 | 44.8 | 23.4 |
| Volgo-Vyatka | 2.0 | 1.2 | 20.6 | 10.7 |
| Volga | .3 | .2 | 10.1 | 5.3 |
| Urals | 9.4 | 5.8 | 9.7 | 5.1 |
| West Siberia | 103.8 | 63.6 | 3.6 | 1.9 |
| Soviet Far East | 5.4 | 3.3 | 2.0 | 1.0 |
| Other | 5.0 | 3.1 | .9 | .4 |
| Ukrainian S.S.R | 2.3 | 1.4 | 27.6 | 14.4 |
| Belorussian S.S.R | 4.9 | 3.0 | 41.7 | 21.8 |
| Georgian S.S.R | .1 | .1 | .2 | .1 |
| Lithuanian S.S.R | .8 | .5 | 3.4 | 1.8 |
| Latvian S.S.R | 1.7 | 1.0 | 5.3 | 2.8 |
| Estonian S.S.R | 2.3 | 1.4 | 2.6 | 1.3 |
| Total U.S.S.R | 163.2 | 100.0 | 191.6 | 100.0 |

Source: Planovoye khozyaystvo (Planned Economy), Moscow. No. 3, March 1975, p. 124.

There were 79 electric powerplants with a total capacity of 3,740 megawatts, fueled by peat, in operation in the U.S.S.R. in 1974. Fuel peat is also used in domestic heating.

# The Mineral Industry of the United Kingdom

By Horace T. Reno [1]

The United Kingdom began 1974 with industrial plants operating at less than half of normal. Coal miners were refusing to work overtime, and it was apparent that a coal strike was pending. Most industries were operating on a 3-day week to conserve energy. Demand for consumer goods was strong. Nevertheless, the miners struck on February 10, effectively shutting down the entire coal mining industry. By the time the strike was settled by raising miners' wages on March 8, consumer demand had begun to slack off. The price of coal had to be raised to take care of the wage raise. Consequently, in the last half of the year the United Kingdom was in a definite recession, running well in advance of recessions in other member countries of the European Communities (EC).

Throughout the year the United Kingdom was completely dependent on imported oil. The high cost of both oil and coal resulted in increased costs for all goods produced in the country. Wholesale prices rose 25%, retail prices rose 19%, and wages rose 28%. There was a deficit of £5,190 [2] million in the United Kingdom trade balance, £3,491 million of which was the direct result of high oil prices. Imports of steel and automobiles were up sharply from 1973 levels, while domestic production of steel and automobiles was 16% and 12% less, respectively, than the quantities produced in 1973. Inflation practically overwhelmed the United Kingdom economy. The Stage Three Wage-Price Program included special provisions which allowed increases in wages. It is significant that the threshold to trigger these increases was reached 11 times during the year.

A new government department was formed on January 8 to take over full responsibility for energy matters. It was assigned responsibility for coal, electricity, gas, oil, and nuclear power, responsibilities previously held by the Department of Trade and Industry.

[1] Physical scientist, Division of Ferrous Metals.

[2] The value of the United Kingdom pound (UK£) in relation to the U.S. dollar varied erratically in 1974. At yearend, however, the exchange rate was UK£=US$2.35.

## PRODUCTION

Production indexes for the mining and quarrying and the manufacturing branches of the mineral industry were as follows (1970=100):

| | 1973 [r] | 1974 |
|---|---|---|
| Mining and quarrying | [r] 93.6 | 83.8 |
| Manufacturing: | | |
| Ferrous metals | [r] 97.3 | 87.8 |
| Nonferrous metals | [r] 106.1 | 103.2 |
| Brick, pottery, glass, etc | [r] 126.2 | 107.1 |
| Chemicals | [r] 121.6 | 127.6 |
| Coal and petroleum products | 110.0 | 106.1 |
| All industry | [r] 109.9 | 106.4 |

[r] Revised.

Source: Central Statistical Office (London). Monthly Digest of Statistics. No. 351, March 1975, pp. 50–53.

## Table 1.—United Kingdom: Production of mineral commodities

(Thousand metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Alumina | 116 | 97 | 95 |
| Metal: | | | |
| Primary | 171 | 252 | 293 |
| Secondary | 197 | 210 | 207 |
| Antimony, primary smelter e 1 metric tons | r 7,400 | 7,800 | NA |
| Cadmium metal, including secondary do | 240 | 314 | 280 |
| Copper: | | | |
| Ore and concentrate, metal content do | r 238 | 459 | 436 |
| Refined: | | | |
| Primary do | 59,579 | 75,858 | 69,100 |
| Secondary do | 121,132 | 108,479 | 91,000 |
| Iron and steel: | | | |
| Iron ore | 9,048 | 7,105 | 3,602 |
| Pig iron | 15,164 | 16,679 | 13,811 |
| Ferroalloys, blast furnace: | | | |
| Ferromanganese | 141 | 145 | 83 |
| Spiegeleisen | 11 | 15 | 8 |
| Total | 152 | 160 | 91 |
| Steel: | | | |
| Crude | 25,321 | 26,649 | 22,426 |
| Semimanufactures: | | | |
| Sections | 5,188 | 6,029 | 5,753 |
| Wire rods | 1,451 | 1,790 | 1,549 |
| Plates and sheets | 9,226 | 9,638 | 7,872 |
| Strip | 1,490 | 1,757 | 1,121 |
| Pipe tube and stock | 813 | 840 | 739 |
| Railway track material | 246 | 255 | 285 |
| Other rolled 2 | 1,343 | 1,052 | 1,027 |
| Castings and forgings | 349 | 350 | 398 |
| Total | 20,106 | 21,711 | 18,744 |
| Lead: | | | |
| Mine output, metal content metric tons | r 400 | 200 | 4,000 |
| Metal: | | | |
| Bullion, from imported ores and concentrates do | 25,052 | 30,306 | 29,380 |
| Refined: | | | |
| Primary 3 do | 121,000 | 120,117 | 136,994 |
| Secondary 4 do | 149,621 | 145,009 | 139,916 |
| Total do | 270,621 | 265,126 | 276,910 |
| Magnesium metal including secondary do | 2,700 | 3,100 | 3,800 |
| Nickel metal, refined including ferronickel do | 31,900 | 36,800 | 32,600 |
| Tin: | | | |
| Mine output, metal content long tons | 3,274 | 3,723 | 2,534 |
| Metal: | | | |
| Primary do | 20,996 | 17,391 | 11,631 |
| Secondary do | 4,892 | 2,586 | 3,505 |
| Tungsten, mine output, metal content metric tons | 2 | -- | 10 |
| Zinc: | | | |
| Ore and concentrate, metal content do | r 1,231 | 2,909 | 3,005 |
| Smelter do | 73,826 | 83,860 | 84,351 |
| **NONMETALS** | | | |
| Barite and witherite | r 15 | e 23 | 50 |
| Bromine metric tons | r 30,400 | 30,600 | 27,200 |
| Calcite | r 19 | 12 | 21 |
| Cement, hydraulic | 18,048 | 19,986 | 17,781 |
| Chalk | r 19,995 | 23,232 | 20,415 |
| Clays: | | | |
| Fire clay | r 2,108 | 1,733 | 2,277 |
| Fuller's earth e | r 174 | r 185 | 166 |
| Kaolin (china clay) | r 2,961 | 3,409 | 3,500 |
| Potters' and ball clay | r 699 | 755 | 806 |
| Other including clay shale | r 33,669 | 35,181 | 30,337 |
| Diatomite metric tons | 9,000 | 4,000 | 4,000 |
| Feldspar (china stone) | 53,000 | 49,000 | e 50,000 |
| Fertilizers, manufactured: 5 | | | |
| Nitrogenous (N content) | 722 | 751 | 811 |
| Phosphatic ($P_2O_5$ content) | r 473 | 467 | 430 |
| Other, gross weight | r 2,954 | 2,786 | 2,827 |
| Fluorspar: | | | |
| Acid grade | 141 | 120 | 124 |
| Metallurgical grade | 57 | 49 | 36 |
| Ungraded | r 24 | 64 | 73 |
| Total | r 222 | 233 | 233 |

See footnotes at end of table.

**Table 1.—United Kingdom: Production of mineral commodities—Continued**
(Thousand metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| NONMETALS—Continued | | | | |
| Gypsum, plaster and anhydrite | | r 5,183 | 5,333 | e 3,863 |
| Refractory products: [7] | | | | |
| Bricks | | 936 | 925 | 941 |
| Cement | | 41 | 45 | 47 |
| Other | | 122 | 129 | 131 |
| Salt: | | | | |
| Rock | | r 1,306 | 1,121 | 990 |
| Brine | | e 7,600 | 1,643 | 1,862 |
| Other | | | 5,754 | 5,569 |
| Stone, sand and gravel: | | | | |
| Stone: | | | | |
| Chert and flint | | e 122 | 141 | 160 |
| Igneous rock and perlite | | r 40,587 | 48,991 | 41,717 |
| Limestone and dolomite including marble | | r 94,217 | 105,909 | 100,915 |
| Sandstone, including ganister | | r 12,511 | 16,830 | 14,380 |
| Slate | | 59 | 64 | 64 |
| Sand and gravel: | | | | |
| Common sand and gravel | | r 123,600 | 136,000 | 120,300 |
| Special sands | | 5,478 | 6,384 | 4,467 |
| Strontium minerals | metric tons | 4,400 | 4,338 | 2,000 |
| Sulfur: | | | | |
| Elemental | | 41 | 28 | 65 |
| Sulfuric acid | | 3,449 | 3,886 | 3,855 |
| Talc, soapstone, and pyrophyllite | metric tons | 16,100 | 20,333 | 20,600 |
| MINERAL FUELS AND RELATED MATERIALS | | | | |
| Carbon black | | 204 | 218 | 201 |
| Coal: | | | | |
| Anthracite | | r 3,442 | 3,354 | 2,534 |
| Bituminous | | r 116,098 | 126,822 | 106,684 |
| Other | | r 2,200 | 1,900 | 982 |
| Coke: | | | | |
| Metallurgical | | r 17,101 | 17,777 | 15,776 |
| Gashouse | | r 259 | 212 | 16 |
| Breeze, all types | | 1,239 | 1,148 | 1,052 |
| Fuel briquets, all grades | | r 1,252 | 1,185 | 992 |
| Gas: | | | | |
| Manufactured [8] | million therms | 963 | 1,004 | NA |
| Natural | million cubic feet | r 939,331 | 1,018,400 | 1,160,293 |
| Natural gas liquids | thousand 42-gallon barrels | r 2,375 | 2,698 | 3,059 |
| Petroleum: | | | | |
| Crude | do | r 646 | 641 | 641 |
| Refinery products: | | | | |
| Gasoline: | | | | |
| Aviation | do | 271 | 560 | 2,478 |
| Motor | do | 115,914 | 126,210 | 123,473 |
| Jet fuel | do | 36,585 | 38,920 | 33,905 |
| Kerosine | do | 20,517 | 21,042 | 21,548 |
| Distillate fuel oil | do | 190,508 | 207,790 | 206,295 |
| Residual fuel oil | do | 273,203 | 280,021 | 266,669 |
| Lubricants | do | 9,328 | 10,334 | 10,185 |
| Other | do | 85,416 | 101,752 | 103,125 |
| Refinery fuel and losses | do | 60,776 | 56,311 | 52,269 |
| Total | do | 792,518 | 842,940 | 819,852 |

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Includes antimony content of antimonial lead and antimony compounds.
[2] Includes wheels, centers, tires, and axles, and semimanufactures for sale.
[3] Lead refined from imported bullion.
[4] Lead refined from scrap materials and domestic ores.
[5] Year ending May 31 of that stated.
[6] Excludes plaster.
[7] Consists of bricks, retorts, molds, and other refractory products made from clays, silica, siliceous material, magnesite, alumina and chrome materials.
[8] Gas made at gasworks plus purchased coke oven and refinery gas.

## TRADE

Trade in mineral commodities in 1974 accounted for approximately 23% of the value of all exports and 16% of the value of all imports by the United Kingdom, almost exactly the reverse of the ratios between the value of mineral commodities and the total value of exports and imports in 1973.

Approximate values of major mineral commodities traded in 1974 follow:

| Commodity | Value (million dollars) | |
|---|---|---|
| | Exports | Imports |
| Petroleum, crude | 66 | 8,566 |
| Diamond, gem and industrial | 1,949 | 1,780 |
| Iron and steel | 364 | [1] 756 |
| Copper | 420 | 950 |
| Refined gold bullion | 3,327 | 980 |
| Petroleum products | 1,527 | 1,566 |
| Silver and platinum-group metals [1] | 602 | 561 |
| Aluminum | 172 | [1] 392 |
| Nickel | 210 | [1] 224 |
| Lead and zinc | 114 | [1] 403 |
| Tin | 88 | [1] 134 |

[1] Including ores and concentrates.
Source: Overseas Trade Accounts of the United Kingdom, December 1974.

## Table 2.—United Kingdom: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite and concentrate | r 440 | 519 | NA. |
| Oxide and hydroxide | 19,333 | 33,328 | Norway 631. |
| Metal including alloys: | | | |
| Scrap | 2,994 | 3,455 | West Germany 1,291; France 1,061; Ireland 370. |
| Unwrought | 84,962 | 85,328 | Netherlands 18,026; West Germany 12,237; Canada 11,037. |
| Semimanufactures | 35,383 | 53,925 | Ireland 5,790; West Germany 3,338. |
| Antimony metal [1] | r 700 | 700 | NA. |
| Arsenic trioxide, pentoxide and acids value, thousands | r $215 | $549 | NA. |
| Beryllium metal including alloys, all forms | 10 | 11 | NA. |
| Bismuth metal including alloys [1] | 308 | 460 | NA. |
| Cadmium metal including scrap | r 195 | 133 | NA. |
| Chromium: | | | |
| Chromite | 769 | 10 | NA. |
| Oxide and hydroxide value, thousands | r $1,333 | $1,283 | NA. |
| Metal including alloys, all forms [1] | r 1,600 | 2,400 | NA. |
| Cobalt: | | | |
| Oxide and hydroxide | 342 | 185 | Brazil 11. |
| Metal including matte, speiss, etc. [1] | 400 | 500 | NA. |
| Columbium and tantalum metal including alloys, all forms, tantalum | 8 | 11 | NA. |
| Copper: | | | |
| Ore and concentrate | 2,178 | 1,224 | Belgium-Luxembourg 1,089. |
| Metal including alloys: | | | |
| Scrap | 2,170 | 10,778 | West Germany 4,191; Belgium-Luxembourg 2,746. |
| Unwrought | 64,254 | 110,666 | West Germany 14,530; Italy 13,355. |
| Semimanufactures | 97,174 | 132,010 | Switzerland 19,010; Poland 17,526. |
| Gold, unworked or partly worked: | | | |
| Bullion, refined thousand troy ounces | 14,706 | 17,290 | NA. |
| Other do | 97 | 108 | NA. |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite | 81 | 103 | NA. |
| Metal: | | | |
| Scrap thousand tons | 1,091 | 741 | Spain 327; Italy 115; Netherlands 88. |
| Pig iron, ferroalloys, and similar materials do | 49 | 45 | West Germany 9; Sweden 4. |
| Steel, primary forms do | 455 | 221 | United States 71; Italy 39; Spain 19. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections: | | | |
| Wire rod do | 315 | 360 | United States 147; West Germany 29; Ireland 14. |

See footnotes at end of table.

## Table 2.—United Kingdom: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Metal—Continued | | | |
| Semimanufactures—Continued | | | |
| Bars, rods, angles, shapes, sections—Continued | | | |
| Other bars and rods thousand tons | 438 | 511 | United States 147; India 40; West Germany 23. |
| Angles, shapes, sections ____ do ____ | 473 | 400 | United States 127; Canada 56; U.S.S.R. 33. |
| Universals, plates and sheets: | | | |
| Universals and heavy plates, uncoated do ____ | 473 | 415 | Brazil 84; United States 61; France 35. |
| Medium plates and sheets, uncoated do ____ | 102 | 83 | Brazil 16; People's Republic of China 4. |
| Light plates and sheets, uncoated do ____ | 949 | 621 | United States 153; Spain 85; Sweden 45. |
| Tinned plates and sheets _____ do ____ | 320 | 352 | United States 27; Argentina 23; Greece 22. |
| Other coated plates and sheets _ do ____ | 263 | 307 | Norway 36; United States 27; France 19. |
| Hoop and strip __ do ____ | 125 | 179 | United States 25; Argentina 16; Sweden 15. |
| Rails and accessories do ____ | 119 | 145 | France 49; Italy 20; Kenya 11. |
| Wire _____ do ____ | 99 | 123 | United States 25; Canada 22; Italy 11. |
| Tubes, pipes, and fittings _____ do ____ | 537 | 583 | United States 63; Sweden 55; Ireland 48. |
| Castings and forgings, rough _____ do ____ | 35 | 56 | United States 16; Sweden 16. |
| Total _____ do ____ | 4,248 | 4,135 | |
| Lead: | | | |
| Ore and concentrate _____ | 5,835 | 9,173 | Belgium-Luxembourg 6,641. |
| Oxides _____ | 481,959 | 9,454 | Ireland 2,538; Poland 377. |
| Metal including alloys: | | | |
| Scrap _____ | 550 | 7,422 | West Germany 3,676; Belgium-Luxembourg 1,288; Netherlands 833. |
| Unwrought _____ | 147,340 | 147,481 | West Germany 41,365; Netherlands 18,374. |
| Semimanufactures _____ | 2,323 | 2,828 | Netherlands 332; Ghana 260; Poland 251. |
| Magnesium metal including alloys: | | | |
| Scrap _____ | 50 | 272 | NA. |
| Unwrought _____ | 1,522 | 1,375 | France 278; West Germany 127. |
| Semimanufactures _____ | 217 | 343 | NA. |
| Manganese: | | | |
| Ore and concentrate _____ | 2,543 | 3,520 | West Germany 1,390. |
| Oxides _____ | 1,883 | 4,438 | NA. |
| Mercury _____ 76-pound flasks __ | 2,071 | 1,361 | NA. |
| Molybdenum metal including alloys, all forms _____ | 57 | 118 | Netherlands 33. |
| Nickel: | | | |
| Matte, speiss, and similar materials | 2,680 | 952 | West Germany 193. |
| Metal including alloys: | | | |
| Scrap _____ | 2,640 | 2,379 | Netherlands 831; West Germany 483; United States 369. |
| Unwrought _____ | 33,342 | 36,549 | West Germany 8,916; United States 7,018; France 5,137. |
| Semimanufactures _____ | 12,073 | 14,456 | United States 3,318; France 1,167; Japan 958. |
| Platinum-group metals and silver: | | | |
| Ore and concentrate value, thousands ____ | r $490 | -- | |
| Waste and sweepings ____ do ____ | r $283 | $932 | NA. |
| Metals including alloys: | | | |
| Platinum group thousand troy ounces | 1,665 | 2,143 | United States 792; Japan 202; West Germany 136. |

See footnotes at end of table.

## Table 2.—United Kingdom: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Platinum-group metals and silver—Continued | | | |
| Metals including alloys—Continued | | | |
| Silver: | | | |
| Refined thousand troy ounces | 84,455 | 88,297 | NA. |
| Other do | 11,127 | 12,422 | NA. |
| Tin: | | | |
| Ore and concentrate long tons | 31 | 449 | Malaysia 260; Spain 96; Brazil 80. |
| Oxides do | 412 | 444 | NA. |
| Metal including alloys: | | | |
| Scrap do | 23 | 50 | NA. |
| Unwrought do | 15,304 | 18,440 | Netherlands 5,033; Poland 1,888; France 1,691. |
| Semimanufactures do | 879 | 602 | Norway 313; Sweden 86. |
| Titanium oxides | 10,939 | 9,356 | Netherlands 952; Ireland 760; Poland 614. |
| Tungsten: | | | |
| Ore and concentrate | 398 | 729 | West Germany 221; United States 211; Netherlands 151. |
| Metal including alloys, all forms | 111 | 273 | Netherlands 68. |
| Uranium and thorium metals including alloys, all forms kilograms | 600 | 600 | NA. |
| Zinc: | | | |
| Ore and concentrate | 5,837 | 6,809 | All to Sweden. |
| Oxide and peroxide | 7,046 | 9,724 | Belgium-Luxembourg 1,789; France 664. |
| Metal including alloys: | | | |
| Scrap | 1,017 | 2,356 | Belgium-Luxembourg 930; France 503. |
| Unwrought | 15,820 | 26,665 | Ireland 5,097; United States 3,718; Netherlands 2,808. |
| Semimanufactures | 7,457 | 11,416 | Denmark 1,698; Portugal 296. |
| Other: | | | |
| Ore and concentrate: | | | |
| Of molybdenum, tantalum, titanium, vanadium, and zirconium | 1,302 | 3,250 | Japan 583; West Germany 79; U.S.S.R. 39. |
| Of base metals, n.e.s. value, thousands | r $215 | $309 | NA. |
| Ash and residue containing nonferrous metals | 21,942 | 39,425 | West Germany 12,506; Belgium-Luxembourg 10,222; Canada 8,036. |
| Oxides, hydroxides, and peroxides of metals, n.e.s. value, thousands | r $11,949 | $21,430 | France $4,431; United States $4,007; West Germany $2,111. |
| Metals including alloys, all forms: | | | |
| Metalloids, n.e.s do | r $1,921 | $2,364 | Sweden $213; West Germany $123. |
| Alkali, alkaline earth, and rare-earth metals | 305 | 341 | NA. |
| Pyrophoric alloys | 53 | 102 | NA. |
| Base metals including alloys, all forms, n.e.s | r 1,260 | 2,390 | NA. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 7,786 | 4,705 | United States 284. |
| Dust and powder of precious and semiprecious stones value, thousands | r $6,164 | $7,197 | France $1,373; Japan $1,206; United States $983. |
| Grinding and polishing wheels and stones | 6,369 | 7,883 | Sweden 937; Finland 503; Poland 395. |
| Asbestos, crude and waste | 3,710 | 2,826 | France 581; West Germany 507; Italy 385. |
| Barite and witherite | 1,488 | 2,135 | NA. |
| Boric oxide and acid | 143 | 173 | NA. |
| Cement thousand tons | 793 | 1,506 | United States 1,123; Canary Islands 115; Ivory Coast 85. |
| Chalk | 32,917 | 45,137 | NA. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s. thousand tons | 2,509 | 2,848 | West Germany 468; Italy 452; France 317. |

See footnotes at end of table.

## Table 2.—United Kingdom: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Clays and clay products (including all refractory brick)—Continued | | | |
| Products: | | | |
| Refractory (including nonclay bricks) ____ thousand tons __ | 249 | 347 | Belgium-Luxembourg 63; West Germany 54; Sweden 32. |
| Nonrefractory _____ do ____ | 84 | 91 | United States 20; Canada 16; Australia 8. |
| Cryolite and chiolite _____ | 12 | 23 | NA. |
| Diamond, all grades _ value, millions __ | r $1,141 | $1,949 | Switzerland $557; Belgium-Luxembourg $538; United States $376. |
| Diatomite and other infusorial earth __ | 3,676 | 3,080 | NA. |
| Feldspar and fluorspar _____ | 70,883 | 88,655 | Canada 30,319; Norway 16,141; Netherlands 10,635. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous _____ | __ | 37 | NA. |
| Phosphatic _____ | 103 | 2,599 | NA. |
| Potassic _____ | 139 | 90 | NA. |
| Other _____ | 234 | 762 | NA. |
| Manufactured: | | | |
| Nitrogenous value, thousands __ | r $5,977 | $7,720 | Ireland $2,813; India $1,758; West Germany $459. |
| Phosphatic _____ | 57,290 | 75,879 | Ireland 22,605. |
| Potassic _____ | 2,822 | 1,832 | NA. |
| Other, including mixed _____ | 105,176 | 266,421 | Ireland 131,130; West Germany 36,164. |
| Graphite, natural _____ | 1,909 | 1,815 | NA. |
| Gypsum and plasters _____ | 11,137 | 14,712 | NA. |
| Lime _____ | 42,216 | 38,368 | Nigeria 9,303. |
| Magnesite _____ | 3,261 | 2,027 | NA. |
| Mica: | | | |
| Crude, including splittings and waste _____ | 12,337 | 5,559 | NA. |
| Worked, including agglomerated splittings _____ | 154 | 274 | West Germany 70; Belgium-Luxembourg 30. |
| Pigments, mineral: | | | |
| Natural, crude _____ | 1,651 | 2,668 | NA. |
| Iron oxides, processed _____ | 9,000 | 7,172 | NA. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural _____ value, thousands __ | r $21,015 | $43,806 | Switzerland $13,816; France $5,088; Hong Kong $3,872. |
| Manufactured _____ do ____ | r $150 | $243 | NA. |
| Salt _____ thousand tons __ | 421 | 479 | Sweden 162; Nigeria 115; Ireland 44. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda _____ | 176,591 | 276,446 | Australia 126,795; New Zealand 19,591; Canada 18,416. |
| Caustic potash, sodic and potassic peroxides _____ | 814 | 876 | NA. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked _____ | 10,489 | 12,502 | West Germany 6,089. |
| Worked _____ | 4,074 | 5,381 | France 2,112; Denmark 733. |
| Dolomite, chiefly refractory grade _ | 24,750 | 21,192 | Chile 14,973. |
| Gravel and crushed rock thousand tons __ | 3,863 | 4,132 | France 1,910; Netherlands 1,122; West Germany 498. |
| Limestone (except dimension) ____ | 41,739 | 53,220 | NA. |
| Quartz and quartzite _____ | 259 | 228 | NA. |
| Sand, excluding metal bearing ____ | 56,772 | 74,969 | Ireland 28,770. |
| Strontium minerals, celestite [1] _____ | 4,300 | 3,000 | NA. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal _____ | 2,073 | 1,830 | NA. |
| Colloidal _____ | 142 | 597 | NA. |
| Sulfur dioxide _____ value __ | r $17,513 | $34,331 | NA. |
| Sulfuric acid _____ | 19,069 | 68,294 | Ireland 35,337; Spain 7,388. |
| Talc, steatite, soapstone, and pyrophyllite _____ | 1,729 | 2,044 | NA. |
| Other nonmetals, n.e.s.: | | | |
| Crude _____ | 472,672 | 517,817 | Norway 209,634; Belgium-Luxembourg 115,338; West Germany 95,943. |

See footnotes at end of table.

## Table 2.—United Kingdom: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Other nonmetals n.e.s.—Continued | | | |
| Slag, dross and similar waste, not metal bearing: | | | |
| From iron and steel manufacture | 127,782 | 135,879 | West Germany 130,830. |
| Slag and ash, n.e.s | 1,573 | 1,771 | NA. |
| Oxides and hydroxides of magnesium, strontium and barium | 15,893 | 40,596 | United States 7,199; France 4,878; West Germany 3,817. |
| Halogens, other than chlorine | 1,529 | 1,843 | NA. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 102,573 | 75,077 | Ireland 10,328. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 3,665 | 8,420 | Ireland 3,243; Denmark 1,650. |
| Carbon black | 43,197 | 48,415 | Ireland 6,445; France 5,171; West Germany 4,011. |
| Coal and briquets: | | | |
| Anthracite and bituminous coal thousand tons | 1,749 | 2,693 | West Germany 1,607; France 507; Belgium-Luxembourg 145. |
| Briquets of anthracite and bituminous coal do | 124 | 176 | Norway 170. |
| Lignite and lignite briquets | 390 | 202 | NA. |
| Coke and semicoke thousand tons | 382 | 586 | Norway 214; Sweden 211. |
| Gas, manufactured | 16 | -- | |
| Hydrogen and rare gases | 963 | 1,292 | NA. |
| Peat, including peat briquets and litter | 500 | 1,083 | NA. |
| Petroleum: | | | |
| Crude and partly refined: | | | |
| Crude thousand 42-gallon barrels | 21,398 | 20,510 | Ireland 7,612; West Germany 2,638; Belgium-Luxembourg 2,456. |
| Partly refined do | 2,784 | 581 | Netherlands 329; West Germany 150; Ireland 59. |
| Refinery products: | | | |
| Gasoline (including natural) do | 17,670 | 19,591 | Sweden 5,184; Ireland 4,625; Denmark 3,178. |
| Kerosine and jet fuel do | 9,231 | 7,317 | Norway 2,298; Ireland 1,865; Sweden 1,080. |
| Distillate fuel oil do | 45,183 | 47,327 | Sweden 17,406; Denmark 10,822; Norway 4,342. |
| Residual fuel oil do | 37,024 | 37,291 | Denmark 12,059; Ireland 9,261; Sweden 6,122. |
| Lubricants do | 5,209 | 5,656 | Belgium-Luxembourg 511; Sweden 424; Denmark 364. |
| Other: | | | |
| Liquefied petroleum gas do | 1,569 | 2,163 | Ireland 694; Portugal 388; United States 358. |
| Mineral jelly and wax do | 36 | 110 | Netherlands 22; West Germany 19; Ireland 12. |
| Nonlubricating oils, n.e.s do | 345 | 4,250 | Netherlands 3,189; Republic of South Africa 56. |
| Bitumen and other residues, and bituminous mixtures, n.e.s do | 731 | 457 | Ireland 204. |
| Pitch, pitch coke, and petroleum coke do | 1,280 | 1,110 | Norway 430; Italy 147; Canada 107. |
| Total do | 118,278 | 125,272 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals value, thousands | r $7,445 | $9,895 | Netherlands $1,341; West Germany $814; United States $706. |

r Revised. NA Not available.

[1] Source: Institute of Geological Sciences, United Kingdom Mineral Statistics 1974, London. Her Majesty's Stationary Office, 1974, 144 pp.

Source: Unless otherwise specified, official United Kingdom export returns.

## Table 3.—United Kingdom: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite and concentrate thousand tons | 319 | 299 | Ghana 225; Greece 48. |
| Oxide and hydroxide do | 315 | 546 | Jamaica 339. |
| Metal including alloys: | | | |
| Scrap do | 14 | 21 | NA. |
| Unwrought do | 267 | 287 | Norway 136; Canada 63; Ghana 21. |
| Semimanufacturers do | 86 | 94 | United States 20; Norway 16; Belgium-Luxembourg 11. |
| Arsenic trioxide, pentoxide and acids [1] | 2,800 | 6,300 | NA. |
| Beryllium metal including alloys, all forms | 6 | 13 | United States 12. |
| Bismuth metal including alloys, all forms [1] | 531 | 550 | NA. |
| Cadmium metal including alloys, all forms [1] | 1,377 | 1,338 | NA. |
| Chromium: | | | |
| Chromite thousand tons | 77 | 199 | Republic of South Africa 103; Philippines 88. |
| Oxide and hydroxide value, thousands | r $803 | $709 | NA. |
| Cobalt: | | | |
| Oxide and hydroxide | 732 | 808 | Mainly from Canada. |
| Metal including alloys, all forms [1] | 1,300 | 1,900 | NA. |
| Columbium and tantalum, tantalum metal including alloys, all forms | 27 | 67 | United States 29. |
| Copper: | | | |
| Ore and concentrate | 57 | 204 | NA. |
| Matte | 300 | 15 | All from United States. |
| Metal including alloys: | | | |
| Scrap | 17,716 | 23,712 | United States 8,369; Ireland 3,007; Netherlands 1,799. |
| Unwrought | 448,752 | 466,591 | Zambia 122,755; Chile 87,811; Canada 87,099. |
| Semimanufactures | 24,093 | 40,284 | Canada 8,177; West Germany 5,319; Finland 4,334. |
| Gold, unworked or partly unworked: | | | |
| Bullion: | | | |
| Refined thousand troy ounces | 19,073 | 21,610 | NA. |
| Unrefined do | 392 | 371 | NA. |
| Other do | 70 | 114 | NA. |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite thousand tons | 17,351 | 22,918 | Canada 5,476; Sweden 4,671; Brazil 2,437. |
| Roasted pyrite do | 361 | 237 | Sweden 180; Greece 26. |
| Metal: | | | |
| Scrap do | 40 | 222 | United States 139; Netherlands 13. |
| Pig iron, including cast iron, sponge, powder and shot do | 199 | 148 | Norway 56; Finland 28; U.S.S.R. 19. |
| Ferroalloys: | | | |
| Ferromanganese do | 92 | 79 | Norway 45; Republic of South Africa 21. |
| Other do | 218 | 244 | NA. |
| Steel, primary forms do | 482 | 263 | Netherlands 39; U.S.S.R. 23; Japan 21. |
| Semimanufacturers: | | | |
| Bars, rods, angles, shapes, sections: | | | |
| Wire rods do | 96 | 103 | Sweden 25; West Germany 16; Netherlands 12. |
| Other bars and rods do | 531 | 501 | Netherlands 85; Sweden 77; West Germany 63. |
| Angles, shapes, sections do | 142 | 132 | Belgium-Luxembourg 39; Republic of South Africa 31; Sweden 9. |
| Universals, plates, and sheets: | | | |
| Heavy and medium plates and sheets, uncoated do | 315 | 381 | West Germany 93; Sweden 57; Poland 40. |

See footnotes at end of table.

## Table 3.—United Kingdom: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Metal—Continued | | | |
| Semimanufacturers—Continued | | | |
| Universals, plates, and sheets—Continued | | | |
| Light plates and sheets, uncoated thousand tons | 652 | 774 | Netherlands 200; West Germany 180; Belgium-Luxembourg 111. |
| Tinned plates and sheets ____ do | 48 | 40 | Netherlands 26; West Germany 9. |
| Other coated plates and sheets ____ do | 142 | 112 | Belgium-Luxembourg 38; Australia 15; West Germany 10. |
| Hoop and strip ____ do | 70 | 76 | West Germany 22; Sweden 11; United States 8. |
| Rails and accessories ____ do | (2) | 1 | NA. |
| Wire ____ do | 13 | 30 | Sweden 5; Belgium-Luxembourg 3. |
| Tubes, pipes, and fittings ____ do | 190 | 407 | West Germany 143; Japan 86; Netherlands 27. |
| Castings and forgings, rough ____ do | 4 | 10 | West Germany 2. |
| Total ____ do | 2,203 | 2,567 | |
| Lead: | | | |
| Ore and concentrates ____ do | 29 | 39 | Peru 14. |
| Oxides | 12,321 | 697 | NA. |
| Metal including alloys: | | | |
| Scrap | 3,034 | 2,630 | Belgium-Luxembourg 554; Netherlands 74; Spain 17. |
| Unwrought ____ thousand tons | 207 | 216 | Australia 157; Canada 46. |
| Semimanufactures | 1,126 | 1,994 | Ireland 1,416; Netherlands 225. |
| Magnesium metal including alloys: | | | |
| Scrap | 1,379 | 445 | West Germany 63. |
| Unwrought | 5,198 | 6,194 | Norway 3,003; United States 1,044; Canada 913. |
| Semimanufactures | 340 | 102 | NA. |
| Manganese: | | | |
| Ore and concentrates thousand tons | 361 | 588 | Republic of South Africa 247; Brazil 172; Ghana 43. |
| Oxides | 4,733 | 5,112 | Japan 4,066. |
| Metal[1] | r 3,300 | 4,000 | NA. |
| Mercury ____ 76-pound flasks | 22,784 | 21,616 | Spain 7,190; Mexico 2,043; Turkey 1,701. |
| Molybdenum: | | | |
| Ore and concentrate[1] | 9,051 | 11,234 | NA. |
| Metal including alloys, all forms | 162 | 163 | Austria 108; United States 23. |
| Nickel: | | | |
| Matte, speiss, and similar materials | 60,390 | 48,264 | Canada 48,029. |
| Metal including alloys: | | | |
| Scrap | 2,696 | 4,822 | Netherlands 1,120; West Germany 651. |
| Unwrought | 17,964 | 23,924 | Canada 15,095; Australia 3,535; Norway 2,842. |
| Semimanufactures | 3,075 | 2,743 | United States 903; Australia 761; West Germany 651. |
| Platinum-group metals and silver: | | | |
| Ore and concentrate value, thousands | r $67,846 | $116,033 | NA. |
| Waste and sweepings ____ do | r $27,342 | $61,428 | Republic of South Africa $10,032; United States $5,248; Canada $2,670. |
| Metals including alloys: | | | |
| Platinum group thousand troy ounces | 316 | 260 | Republic of South Africa 115; U.S.S.R. 80; United States 17. |
| Silver: | | | |
| Refined ____ do | 12,654 | 12,929 | NA. |
| Unrefined ____ do | 3,402 | 12,123 | NA. |
| Other ____ do | 577 | 2,644 | NA. |
| Selenium, elemental[1] | r 174 | 227 | NA. |
| Silicon, elemental[1] | r 16,239 | 22,431 | NA. |
| Tin: | | | |
| Ore and concentrate ____ long tons | 57,947 | 49,633 | Bolivia 36,670; Australia 5,642; Argentina 2,792. |
| Oxides ____ do | 2 | (2) | NA. |
| Metal including alloys: | | | |
| Scrap ____ do | 2,375 | 2,497 | West Germany 416; Netherlands 410; United States 403. |
| Unwrought and semimanufactures ____ do | 6,421 | 6,096 | Nigeria 3,477; Malaysia 1,232; Netherlands 700. |

See footnotes at end of table.

## Table 3.—United Kingdom: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Titanium: | | | |
| Ore and concentrate: | | | |
| Ilmenite[1] ___ thousand tons | r 276 | 359 | NA. |
| Other[1] ___ do | 49 | 49 | NA. |
| Oxides ___ do | 4 | 5 | West Germany 2. |
| Metal including alloys, all forms[1] ___ do | r 2 | 7 | NA. |
| Tungsten: | | | |
| Ore and concentrate | 6,486 | 8,762 | Bolivia 2,420; Netherlands 1,007; People's Republic of China 865. |
| Metal including alloys, all forms | 81 | 60 | France 18; United States 14. |
| Uranium and thorium: | | | |
| Ore and concentrate | 788 | 404 | All from Australia. |
| Metals including alloys, all forms | 2 | -- | |
| Zinc: | | | |
| Ore and concentrate thousand tons | 110 | 141 | Peru 47; Australia 41; Ireland 12. |
| Oxide and peroxide | 1,866 | 929 | NA. |
| Metal including alloys: | | | |
| Scrap and blue powder | 3,369 | 2,874 | East Germany 615; Finland 526; United States 407. |
| Unwrought ___ thousand tons | 231 | 226 | Canada 60; Finland 35; Australia 35. |
| Semimanufactures | 729 | 2,650 | United States 50. |
| Zirconium:[1] | | | |
| Ore and concentrate | 36,500 | 40,600 | NA. |
| Metal including alloys, all forms | r 100 | 100 | NA. |
| Other: | | | |
| Ore and concentrate of tantalum and vanadium | 2,295 | 2,686 | NA. |
| Ash and residue containing nonferrous metals | 83,694 | 78,718 | Canada 38,049; United States 10,155; West Germany 5,593. |
| Oxides, hydroxides and peroxides of metals, n.e.s. value, thousands | r $27,287 | $28,421 | United States $6,964; Canada $3,543; Trinidad and Tobago $3,463. |
| Metals including alloys, all forms: | | | |
| Metalloids, n.e.s ___ do | r $36,834 | $31,996 | NA. |
| Alkali, alkaline earth, and rare-earth metals | 84 | 3,806 | NA. |
| Pyrophoric alloys | 27 | 31 | NA. |
| Base metals including alloys, all forms, n.e.s | r 4,662 | 8,876 | NA. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc ___ thousand tons | 192 | 223 | Italy 129; Turkey 17. |
| Dust and powder of precious and and semiprecious stones value, thousands | r $838 | $1,346 | NA. |
| Grinding and polishing wheels and stones | 2,383 | 2,866 | Italy 390; Netherlands 364; India 364. |
| Asbestos ___ thousand tons | 150 | 198 | Canada 135; Swaziland 26; Republic of South Africa 26. |
| Barite and witherite ___ do | 59 | 89 | Morocco 42; Ireland 17; Spain 7. |
| Boron materials: | | | |
| Borax[1] | r 10,900 | 10,600 | NA. |
| Oxide and acid | 5,685 | 8,015 | France 2,225. |
| Bromine | 1,773 | 1,471 | NA. |
| Cement ___ thousand tons | 137 | 165 | Ireland 154; Denmark 2. |
| Chalk | 449 | 359 | NA. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s. thousand tons | 108 | 152 | United States 83; Republic of South Africa 37. |
| Products: | | | |
| Refractory (including nonclay bricks) | 80,569 | 88,804 | Austria 17,133; Ireland 15,138; Denmark 12,979. |
| Nonrefractory | 125,155 | 71,312 | Ireland 13,736; Belgium-Luxembourg 11,943; France 10,775. |
| Cryolite and chiolite | 2,979 | 4,110 | All from Denmark. |
| Diamond, all grades _ value millions | r $1,216 | $1,780 | NA. |

See footnotes at end of table.

## Table 3.—United Kingdom: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Diatomite and other infusorial earth | 12,059 | 13,948 | United States 5,143; Denmark 3,667. |
| Feldspar and fluorspar thousand tons | 170 | 176 | Norway 127; Finland 30; Canada 9. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous do | 10 | 11 | Chile 10. |
| Phosphatic do | 1,665 | 1,964 | Morocco 1,456; Senegal 226; Tunisia 125. |
| Potassic do | 38 | 35 | East Germany 21; West Germany 12. |
| Manufactured: | | | |
| Nitrogenous do | [3] 236 | 345 | NA. |
| Phosphatic: | | | |
| Thomas (basic) slag | 85,917 | 59,394 | Mainly from Belgium-Luxembourg. |
| Other | 39,693 | 36,320 | France 11,988; Portugal 11,160; Belgium-Luxembourg 3,673. |
| Potassic thousand tons | 724 | 802 | East Germany 240; West Germany 157; U.S.S.R. 130. |
| Other, including mixed do | 377 | 291 | Netherlands 129; Belgium-Luxembourg 54; Ireland 41. |
| Graphite, natural | 9,440 | 13,644 | Malagasy Republic 5,991. |
| Gypsum and plasters thousand tons | 144 | 211 | Ireland 152. |
| Iodine | 594 | 1,076 | NA. |
| Lime | 1,042 | 1,163 | NA. |
| Magnesite thousand tons | 89 | 108 | Spain 41; Greece 27. |
| Mica: | | | |
| Crude, including splittings and waste | 7,444 | 10,336 | Republic of South Africa 5,242; India 779; United States 315. |
| Worked, including agglomerated splittings | 294 | 372 | Belgium-Luxembourg 225; India 28. |
| Pigments, mineral: | | | |
| Natural, crude | 4,475 | 6,351 | NA. |
| Iron oxides, processed | 21,096 | 24,672 | West Germany 20,703; United States 653; France 326. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural value, thousands | [r] $21,796 | $58,181 | Switzerland $18,458; United States $6,000; Brazil $5,812. |
| Manufactured do | [r] $655 | $959 | Switzerland $250; United States $245; Austria $122. |
| Pyrite (gross weight) thousand tons | 133 | 45 | Sweden 21; Norway 12; Spain 11. |
| Salt and brine do | 22 | 22 | West Germany 9; Netherlands 2. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 4,839 | 1,441 | United States 43. |
| Caustic potash, sodic and potassic peroxides | 2,972 | 3,576 | NA. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous | 15,463 | 17,257 | Italy 15,567. |
| Slate | 502 | 151 | NA. |
| Other | 16,307 | 14,513 | Republic of South Africa 5,356; Sweden 3,917. |
| Worked: | | | |
| Slate | 644 | 7,548 | NA. |
| Paving and flagstone | 14,413 | 20,937 | Portugal 20,266. |
| Other | 10,895 | 12,944 | Italy 5,703; India 2,419. |
| Dolomite, chiefly refractory grade | 27,852 | 34,171 | Spain 24,180. |
| Gravel and crushed rock thousand tons | 197 | 252 | Ireland 134; Norway 50; Italy 33. |
| Limestone (except dimension) | 19,729 | 8,281 | NA. |
| Quartz and quartzite | 9,273 | 8,391 | NA. |
| Sand, excluding metal bearing thousand tons | 161 | 208 | Belgium-Luxembourg 146; Netherlands 22. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal do | 1,039 | 1,269 | France 459; Poland 449; Mexico 171. |
| Colloidal | 1,712 | 5,231 | NA. |
| Sulfur dioxide value | [r] $45,032 | $31,879 | NA. |
| Sulfuric acid thousand tons | 163 | 163 | NA. |

See footnotes at end of table.

## Table 3.—United Kingdom: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Talc, steatite, soapstone, and and pyrophyllite | 55,595 | 63,283 | Norway 16,501; France 14,151; People's Republic of China 11,570. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Meerschaum, amber, jet | 10,576 | 14,059 | Spain 13,866. |
| Other thousand tons | 357 | 397 | Italy 91; Norway 74; United States 62. |
| Slag, dross and similar waste, not metal bearing: | | | |
| From iron and steel manufacture | 7,382 | 19,988 | NA. |
| Slag and ash, n.e.s | 14,752 | 16,972 | Netherlands 5,653. |
| Oxides and hydroxides of magnesium, strontium and barium | 18,196 | 12,611 | Italy 9,206; United States 2,625. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 36,709 | 40,797 | Belgium-Luxembourg 24,122; Ireland 9,654; Sweden 810. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 42,325 | 38,435 | Trinidad and Tobago 27,539; United States 3,314. |
| Carbon black and gas carbon: | | | |
| Carbon black | 7,928 | 12,617 | United States 3,400; Netherlands 2,957; East Germany 1,915. |
| Gas carbon | 511 | -- | |
| Coal and briquets: | | | |
| Anthracite and bituminous thousand tons | 4,998 | 1,676 | United States 974; Australia 299; West Germany 190. |
| Briquets of anthracite and bituminous coal do | 313 | 195 | France 107; West Germany 69; Netherlands 19. |
| Lignite and lignite briquets | 203 | 20 | NA. |
| Coke and semicoke thousand tons | 106 | 54 | West Germany 48; Belgium-Luxembourg 4. |
| Hydrogen and rare gases | 1,793 | 1,777 | United States 67. |
| Peat, including peat briquets and litter thousand tons | 119 | 122 | Ireland 113. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | r 782,984 | 849,952 | Saudi Arabia 203,351; Kuwait 153,823; Iran 152,928. |
| Refinery products: | | | |
| Gasoline (including natural) do | 48,539 | 65,530 | Netherlands 13,404; Italy 12,239; Belgium-Luxembourg 6,179. |
| Kerosine and jet fuel do | 11,670 | 12,646 | Netherlands 6,015; Italy 1,824; Belgium-Luxembourg 1,093. |
| Distillate fuel oil do | 15,185 | 16,858 | Netherlands 4,708; Belgium-Luxembourg 2,054; Italy 1,990. |
| Residual fuel oil do | r 64,538 | 50,099 | Netherlands 28,067; France 4,758; Ireland 2,912. |
| Lubricants do | 3,816 | 3,972 | Netherlands Antilles 1,091; United States 786; France 505. |
| Other: | | | |
| Liquefied petroleum gas do | 10,115 | 10,641 | Algeria 6,864; Sweden 1,023; Netherlands 834. |
| Mineral jelly and wax do | 972 | 493 | United States 29; Netherlands 27; East Germany 16. |
| Nonlubricating oils, n.e.s do | r 528 | 715 | Netherlands Antilles 220; Netherlands 100; Venezuela 73. |
| Bitumen and other residues and bituminous mixtures, n.e.s do | 1,433 | 1,504 | Belgium-Luxembourg 813; Netherlands 618. |
| Pitch, pitch coke, and petroleum coke do | 3,748 | 1,797 | United States 992; Belgium-Luxembourg 444; Netherlands 301. |
| Total do | r 160,544 | 164,255 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals value, thousands | r $13,525 | $22,560 | |

r Revised. NA Not available.

[1] Source: Institute of Geological Sciences, United Kingdom Mineral Statistics 1974, London. Her Majesty's Stationary Office, 1974, 144 pp.

[2] Less than ½ unit.

[3] Excludes ammonium sulfate valued at $3,562,563.

Source: Unless otherwise specified, official United Kingdom import returns.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Lynemouth aluminum smelter, the last of the three new smelters constructed since 1969, reached full-capacity production of 120,000 tons per year in the third quarter of 1974. Production at the Invergordon and Anglesey smelters, however, was restricted by power shortages and labor problems; they produced at 80% and 75% of capacity, respectively. Domestic primary aluminum production was an estimated 293,000 tons, an increase of 16% over the quantity produced in 1973. Apparent aluminum consumption of 464,000 tons was about 5% less than the quantity consumed in 1973. Imports of bauxite in 1974 totaled 324,000 tons, valued at £3,140,000. Ghana supplied 223,000 tons valued at £1,695,000, 69% of the total quantity but only 54% of the total value. Imports of aluminum and its alloys, wrought and unwrought, totaled 281,000 tons, 27% less than the quantity imported in 1973.[3]

Although there was a decrease in total apparent consumption of aluminum in 1974, all the major markets except transportation and hollowware used more aluminum in 1974 than in 1973.

The British price for aluminum ingot was still among the lowest in European countries. The United Kingdom Government approved increases in the Alcan Aluminum Co. Ltd. list price for 99.5% primary ingot to £316.5 per ton in March, and £361.5 per ton in August. British Aluminum Co. Ltd. and several semifabricators also received permission to increase ingot prices.

**Iron and Steel.**—The British iron and steel industry began the year with a production cutback owing to a shortage of coal and transportation problems caused by unsettled labor conditions at the coal mines and on the railroads. Most of the industry-wide labor-related problems were solved by the first of April, but wildcat walkouts at steel plants continued to plague the industry. The situation became so bad that British Steel Corp. (BSC) closed its Llawern plant until the unions there agreed to abandon wildcat walkouts.

The country imported 40% more steel in 1974 than in 1973, and exported 23% less. The domestic steel industry produced 22.4 million tons of steel, 16% less than the 26.6 million tons produced in 1973. The total apparent supply of 28.62 million tons after adjustment for producers' stock changes was 7% less than the apparent supply in 1973.

The steel industry consumed 44% less domestically produced iron ore in 1974 than it had consumed in 1973, but consumption of imported ore was only 5% less than in 1973. The trend of declining unit coke consumption was reversed as the industry consumed 606 kilograms of coke per ton of iron in 1974, compared with only 577 kilograms per ton in 1973. There was a severe shortage of iron and steel scrap. The average price more than doubled during the year. Labor productivity, measured by steel output per man-year, was down 11% from the high level achieved in 1973. According to Department of Trade and Industry indices, the average prices of steel and coal, compared with prices in 1973, were up 39% and 37%, respectively.

There was a severe shortage of most forms of steel throughout the year. The Government tightened export controls, and BSC passed up higher prices for steel in foreign markets in favor of home deliveries. Compared with steel shipments in 1973, there were notable differences in shipments of ingots, billets and slabs, heavy plates, hot-rolled strip, tinplate, and all sizes of tubes and pipes. Among finished steel deliveries to home markets, deliveries of iron and steel for repair and maintenance of industrial plant steelworks, to motor vehicle manufacturers, and for construction were substantially below deliveries in 1973. However, deliveries to iron and steel plants for further manufacture, and deliveries to the transportation and communication industries were noticeably higher.

BSC's expansion program was essentially on schedule, but the corporation agreed with the Government to cut back the cost £84 million from the first planned expenditure of £3,000 million. BSC's steel output in 1974 was 19% less than in 1973, but the corporation reported profitable operation for the 2d year in a row. Work was started

[3] Department of Trade and Industry (London). Overseas Trade Statistics of the United Kingdom. December 1974.

on a new iron ore terminal at Hunterston-on-the-Clyde to accommodate ore carriers of up to 250,000 tons. Its operation is vital to the steel plant at Ravenscraig. A £15 million electric arc furnace was being constructed under the expansion program at the Clydesdale works to increase the corporation's share of business related to the oil and gas developments in the North Sea. BSC continued its program of closing uneconomic steelworks and phasing out the high-cost open-hearth furnaces; however, it met opposition from the Government and from steelworkers' unions in closing the steel plants, so its retrenchment program fell somewhat behind schedule.

The use of electricity in the iron and steel industry increased almost 40%, compared with the quantity used in 1973; but the quantity of coal, coke and coke breeze, liquid fuel, and gas consumed per ton of crude steel produced was little changed from the pattern of usage in 1973.

*Iron Ore.*—Phasing out of the domestic iron ore industry was accelerated during the year. Mines produced about half as much ore in 1974 as they did in 1973, and domestic ores provided only 18% of the iron ore consumed. Iron ore imports in 1974 totaled 19,675,000 tons, valued at £166,641,000. Canada was the principal supplier with 22%, followed by Sweden 20%, Brazil 16%, Venezuela 9%, and Mauritania 8%.

*Iron and Steel Scrap.*—Iron and steel scrap was in short supply throughout the year, and the Government restricted exports accordingly. Iron and steel scrap imports totaled 139,548 tons, valued at £12,523,000 in 1974. The United States supplied 89% of this total, and the Netherlands 3%. All other countries together supplied the remaining 8% in small amounts. Scrap exports totaled 312,036 tons, valued at £12,020,000. Eighty-five percent of the iron and steel scrap exports went to EC countries.

**Lead and Zinc.**—Domestic mine production of lead in 1974, as in 1973, was not significant. Refined lead production from primary and secondary materials totaled 277,000 tons, 4% more than in 1973. Lead consumption of 247,000 tons was 12% less than in 1973. Imports of lead ore and concentrate totaled 55,000 tons, 40% more than in 1973. Peru supplied 14,000 tons of the total, EC countries supplied 7,000 tons, and other countries the remaining 41,000 tons. Slab zinc production of 84,351 tons was slightly more than in 1973. Zinc consumption was estimated at 12% less than the 305,000 tons consumed in 1973. Zinc imports for consumption totaled 206,000 tons, 46% more than in 1973. Australia was the principal supplier, followed by Peru and the EC countries. The Irish Republic supplied 22,000 tons of the total.

**Tin.**—The tin mines of Cornwall were affected by restricted working time and power shortages in the first part of the year. They produced 2,534 long tons of tin in 1974, 32% less than in 1973. Smelter production, at 15,136 long tons, was 24% less than in 1973. Consumption of refined tin produced from primary and secondary materials was estimated at 16,700 long tons, 9% less than in 1973. The average price for tin was £3,499.82 per ton.

Cornwall Tin & Mining Corp. decided to bring the Mt. Wellington mine into production at 600 long tons of ore per day for an annual output of 1,500 long tons of metal. The Mt. Wellington mine is in South Cornwall, the other side of the Carnon valley from the Wheal Jane mine.

The United Kingdom imported 39,752 long tons of tin ore and concentrate in 1974, with Bolivia and other South American countries the principal suppliers.

## NONMETALS

**Barite.**—The need for drilling mud for petroleum exploration in the North Sea continued to stimulate interest in barite in the United Kingdom. The Highlands Islands and Development Board released a report on barite deposits in the Scottish highlands and islands.[4] The ports of Aberdeen and Dundee have become supply centers for vessels that serve the specialized needs of the oil rigs drilling in ocean depths of 500 feet and more. Fully integrated supply bases by means of which a vessel can dock and be simultaneously loaded with drilling mud, cement, pipe, water, and fuel were completed at Aberdeen.[5]

**Fluorspar.**—The fluorspar reserves of the United Kingdom have been estimated at

[4] Industrial Minerals. No. 82, July 1974, p. 36.
[5] Port of Houston Magazine. V. 18, No. 9, September 1974, pp. 9–12.

25 million tons averaging 40% $CaF_2$ in all categories, but only about 5 million tons of this quantity can be regarded as proved. Additional potential fluorspar resources have been reported in the Derbyshire area in central England, and further potential in the Durham, Northumberland, and Cumbria areas of northern England.

**Potash.**—Limited commercial production of potash occurred at the Cleveland potash mine at Boulby near Staithes in North Yorkshire. Mining was restricted to a single shaft operation.[6] The production program was delayed when fluid pressures in excess of 1,300 pounds per square inch gage were found in the brine-bearing Bunter Sandstone strata between 2,000 and 3,000 feet. The second shaft has been completed and was being fitted with hoisting equipment for service in 1975. Over 400 men were employed at the property, and it is expected that 600 will be employed when the mine reaches full production. This operation is particularly significant to the United Kingdom economy because despite increases in operating costs since the project was planned, potash mining is expected to make a substantial contribution to the balance of payments.

**Sand and Gravel.**—Increased installation and upkeep costs of new plants due to stricter environmental control regulations in the sand and gravel industry apparently is one of the major reasons that operations tend to favor larger companies. Britain's largest producer of sand and gravel aggregates installed radar on the tugs used to push sand- and gravel-laden barges from the mining area to the processing plant. The radar enables the tugs to avoid islands left in the pit as part of a company reclamation policy.[7]

A single-screw sand and gravel 4,425-ton suction dredge, designed to pump 2,200 tons of material per hour at depths of 23 meters, was delivered to British Dredging Ltd. The dredge can operate at depths up to 45 meters. Dredged material is processed and stored on the vessel. On each voyage the dredge can produce 3,556 tons of drained sand and gravel.[8]

## MINERAL FUELS

**Coal.**—The coal industry began the year with miners refusing to work overtime. The mines were completely shut down by a strike on February 10 which continued to March 8. Limited mine production for more than 6 months depleted coal stocks at electrical generating plants and steel mills. Imported coal partially solved the problem, but the spot prices for imported coal brought the cost up to where coal was not a satisfactory alternative to fuel oil. Moreover, French and Polish coal miners supported their British counterparts, and workers at United Kingdom seaports refused to unload Polish coal from ships docked when the strike started.

In its hearings to settle the strike, the Pay Board apparently discovered that miners' pay, instead of being above average for manual workers in manufacturing, was actually 8% below the average. The Coal Board supported miners' claims for more money and argued that a major shift in the relative position of miners' pay was essential to attract workers to the coal mines. These points were recognized in the settlement, which increased miners' wages an average of 23½% on basic earnings, and within this increase the differential between coal face and other underground workers' wages was increased. A production bonus based on total national output was agreed to by the Coal Board and the miners' union.

Basic earnings, shown in pounds per week, before and after the strike settlement follow:

| | Before settlement | After settlement |
|---|---|---|
| Minimum surface | £36–40 | £41 |
| Minimum underground | 40–40 | 47 |
| Coal face | 49–40 | 61 |

Settlement of the strike apparently alleviated many of the labor problems in the coal mines. The industry produced 125 million tons of coal in the 1974–75 period, compared with 107 million tons in the 1973–74 period. Output of 42 hundredweight per man-shift at the beginning of the year was increased rapidly after the strike, exceeding 47 hundredweight, and for the year as a whole it averaged 45 hundredweight. At pits working at the end of

[6] European Chemical News Large Plants Supplement. V. 26, No. 658, Oct. 18, 1974, pp. 46–48.
[7] Ironman, R. European Editor, International Report. Rock Products, v. 77, No. 11, November 1974, p. 28.
[8] Cement, Lime and Gravel. New Dredging Vessel Launched. V. 49, No. 2, February 1974, p. 42.

March 1975, the number of coal faces increased from 711 to 749 and daily output per face was increased from 556 tons to a record 659 tons per face. Better working conditions in the mines were reflected in the ability of the industry to recruit labor. More than 30,000 men and boys were recruited and the number of mine workers increased by more than 6,000 to almost 200,049, the first increase since 1947. The industry engaged in a major training program for new employees.

A large part of the competitive advantage that coal has had over oil was eroded. Nevertheless, the Energy Board emphasized the use of coal over oil for both the short and the medium term, and the Government decided to invest £600 million in the coal industry over the next decade in addition to that provided in the Coal Industry Act of 1973.

The Government looked to the coal industry as a potentially self-supporting segment of the country's nationalized industrial complex. It was apparent that the industry was establishing a better financial foundation: Ten collieries were closed, and the industry had a profit of £33.8 million in 1974, compared with the 1973 loss of £112.3 million.

Supplying the United Kingdom with coal cost £41.3 million in foreign exchange payments. Imports totaled 3.5 million tons valued at £62.1 million, offset by exports of only 1.9 million tons valued at £20.8 million. Comparable figures in 1973 were imports of 1.7 million tons valued at £21.3 billion, and exports of 2.7 million tons valued at £13.5 million.

The safety record of the coal industry was better in 1974 than in past years because the number of fatalities fell to 56, the lowest on record, and an improvement of 17% compared with the 1973 rate per 100,000 man-shifts. However, the number of reportable serious injury accidents was 576 in 1974, compared with only 461 in 1973.

The National Coal Board agreed with the European Coal and Steel Community (ECSC) that they support research out of the ECSC 1973 and 1974 budget. An international energy agency, established by 16 major industrial nations as a result of the oil crisis, nominated the United Kingdom to lead coal research and development. Investigation of fluidized bed combustion to burn coal smokelessly and efficiently was the principal research during the year.

**Petroleum.**—The Government became increasingly concerned with North Sea oil resources, anticipating that the oil revenues would solve all of Great Britain's monetary and foreign exchange problems. There was increasing pressure within the Government that existing license terms for North Sea oil should be renegotiated to assure that the Government obtain its just share of revenues. Most discussions stopped short of complete nationalization of the industry; nevertheless, that possibility was ever present.

Realities overtook the optimistic forecasts of the past. No North Sea oil from United Kingdom waters was delivered onshore in 1974. Development and significant monetary return from North Sea oil was set back a year or more by labor disputes among the companies supplying North Sea equipment and rapidly rising costs stemming from inflation.

The trade deficit caused by the cost of imported crude oil continued to mount. In 1974 the United Kingdom imported 111.8 million tons of crude and partly refined oil valued at £3,852 million. Exports of petroleum crude and partly refined were valued at only £32 million, leaving a net trade deficit of £3,820 million. Imports of crude petroleum totaled 109,350,993 tons (28.5 billion gallons). Saudi Arabia supplied 32% of the total, Kuwait 15%, Iran 13%, Libya 8%, Nigeria 7%, EC countries 5%, and Venezuela and Iraq 3% each. Other countries supplied the remaining 14%.

Texas North Sea U.K. Co., a wholly-owned subsidiary of Texaco Inc., reported a significant discovery of oil in United Kingdom waters about 116 miles northeast of Aberdeen, Scotland. The discovery well is about 8 miles southwest of the Piper field.[9]

[9] Wall Street Journal. Texaco Unit in U.K. Hits North Sea Oil; Getty Reports Find. V. 184, No. 127, Dec. 30, 1974, p. 12.

# The Mineral Industry of Venezuela

By Ronald F. Balazik [1]

Several events made 1974 one of the most significant periods in the history of Venezuela's mineral industry. Total value of mineral industry output rose to a record high of $10.6 billion [2] during the year; the country's iron ore industry, which accounted for about 3% of total mineral output value, was nationalized at yearend; and the Government made preparations for the impending nationalization of the petroleum industry. This industry accounts for over 96% of total mineral output value, almost 25% of Venezuela's gross domestic product, about 85% of Government ordinary revenues, and nearly 95% of export receipts.

In 1974, Venezuela retained fifth place among the world's crude oil producing nations after the U.S.S.R., the United States, Saudi Arabia, and Iran. In addition, Venezuela remained the world's third leading petroleum exporting country following Saudi Arabia and Iran.

Also during 1974, Venezuela and Mexico ratified agreements implementing technical cooperation in the steel, petroleum, and petrochemical industries. Similar scientific and technical cooperative programs also were discussed during the year with representatives of Algeria, France, Iran, Surinam, and Yugoslavia. In addition, talks were held with Brazil, Ecuador, and Peru to establish a Latin American organization to promote better prices for raw materials, including minerals.

The Ministry of Mines and Hydrocarbons instituted a survey program to determine resources in the Perijá Range, State of Zulia. Prior to the survey, exploration in the 12,000-square-kilometer region was primarily a search for petroleum. However, the present program, expected to require several years for completion, will focus on the discovery of new metal resources.

In 1974, the Government began to implement the Venezuelan Investment Fund, a multimillion-dollar financial assistance program based on oil revenues and designed to assist economic development in Latin America. Specifically, the fund was used to provide price supports for raw materials, subsidize petroleum imports of some Central American countries, and finance projects to develop natural resources. The fund will be used to aid Venezuelan projects as well as those of other Latin American countries.

Venezuela's participation in the Andean Pact (a common market agreement with Bolivia, Chile, Colombia, Ecuador, and Peru) became effective on January 1, 1974. Several provisions of the pact have significant implications for Venezuela's mineral industry. For example, import and export taxes on products such as mineral fertilizers and petrochemicals can be adjusted under tariff regulations of the pact.

The United Nations Third Conference on Law of the Sea convened in Caracas during 1974. Approximately 5,000 officials from 151 of the world's 153 nations attended the conference to formulate a new system of international law governing the utilization of natural resources in marine areas. The delegates discussed nearly 100 issues, including offshore exploration and seabed mining. The conference served to identify and define specific areas of disagreement for arbitration at another meeting to be held in Vienna during 1975.

At yearend 1974, the Ministry of

[1] Physical scientist, Division of Petroleum and Natural Gas.

[2] Where necessary, values have been converted from bolivars (Bs) to U.S. dollars at the ratio of Bs4.40=US$1.00.

Mines and Hydrocarbons was preparing a report concerning mechanisms for promoting the nonmetallic minerals industry of Venezuela. The report also focused on factors that have retarded development of the industry. When completed, the report will be used to devise Government policy for the mining of nonmetallic minerals.

In 1974, Dr. Valentín Hernández became the new Minister of Mines and Hydrocarbons replacing Dr. Hugo Pérez La Salvia.

## PRODUCTION

The performance of Venezuela's mineral industry in 1974 was dominated by the production of petroleum and iron ore. The output of crude and refined petroleum declined significantly while iron ore production reached a record high. Other sectors of the country's mineral industry registered mixed performance during the year.

Table 1.—Venezuela: Production of mineral commodities
(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| **METALS** | | | | |
| Aluminum, unalloyed ingot | | [r] 23,000 | 25,100 | 46,000 |
| Gold, mine output, metal content | troy ounces | 20,355 | 19,020 | 16,966 |
| Iron and steel: | | | | |
| Iron ore and concentrate | thousand tons | 18,499 | 23,110 | 26,424 |
| Metal: | | | | |
| Pig iron | do | 537 | 546 | 545 |
| Crude steel | do | 1,127 | 1,063 | 1,054 |
| Semimanufactures | do | -- | -- | 37 |
| **NONMETALS** | | | | |
| Cement, hydraulic | do | 2,982 | 3,413 | 3,494 |
| Diamond: | | | | |
| Gem | carats | 139,600 | 232,900 | 279,500 |
| Industrial | do | 316,700 | 545,300 | 969,500 |
| Total | do | 456,300 | 778,200 | 1,249,000 |
| Fertilizer materials: | | | | |
| Crude, phosphate rock, marketable | | [r] 44,000 | 95,393 | 121,467 |
| Manufactured, nitrogenous, gross weight | | 218,189 | 233,865 | [e] 250,000 |
| Gypsum | | [e] 100,000 | [r e] 150,000 | 164,500 |
| Salt, all types | | [r e] 220,000 | [r e] 220,000 | 223,173 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | | |
| Carbon black | | 7,500 | 8,000 | 18,000 |
| Coal bituminous | | [r] 40,359 | 49,696 | 57,086 |
| Gas, natural: | | | | |
| Gross production | million cubic feet | [r] 1,625,173 | 1,745,702 | 1,639,511 |
| Marketable production | do | [r] 387,718 | 459,936 | 475,969 |
| Natural gas liquids: | | | | |
| Condensate | thousand 42-gallon barrels | 1,435 | 1,174 | 1,250 |
| Natural gasoline | do | 7,244 | 7,952 | 7,825 |
| Liquefied petroleum gas | do | 20,819 | 23,382 | 21,521 |
| Total | do | 29,498 | 32,508 | 30,596 |
| Petroleum: | | | | |
| Crude | do | 1,178,489 | 1,228,596 | 1,086,333 |
| Refinery products: [2] | | | | |
| Aviation gasoline | do | 194 | 213 | 288 |
| Motor gasoline | do | 30,635 | 32,030 | 36,258 |
| Naphtha | do | 35,747 | 37,125 | 33,694 |
| Jet fuel | do | 13,820 | 16,400 | 12,521 |
| Kerosine | do | 4,163 | 5,632 | 3,583 |
| Distillate fuel oil | do | 54,156 | 58,308 | 48,300 |
| Residual fuel oil | do | 248,244 | 304,229 | 280,494 |
| Lubricants | do | 3,641 | 4,308 | 6,684 |
| Other: | | | | |
| Liquefied petroleum gas | do | 3,772 | 3,563 | 3,091 |
| Asphalt and bitumen | do | 7,587 | 5,258 | 3,800 |
| Refinery gas [3] | do | 7,556 | 7,166 | 5,504 |
| Unspecified | do | 3,148 | 2,610 | 2,322 |
| Total | do | 412,663 | 476,842 | 436,539 |

[e] Estimate. [p] Preliminary. [r] Revised.
[1] In addition to the commodities listed, lime, sand, gravel, clays, and stone are produced, but information is inadequate to make reliable estimates of output levels.
[2] Includes refinery fuels.
[3] Liquid equivalent.

## TRADE

Exports of mineral commodities continued to dominate Venezuela's overall foreign trade. The United States was the principal destination of direct petroleum shipments, followed by the Netherlands Antilles. However, almost all of the petroleum shipments to the latter country consisted of crude and unfinished oils destined for processing at two large refineries owned by the parent companies of Creole Petroleum Corp. and Shell Quimica de Venezuela, Venezuela's first- and second-ranking crude oil producers. These refineries export their output and are, in a sense, an integral part of Venezuela's petroleum industry.

Exports of Venezuelan petroleum from Venezuela and the Netherlands Antilles by principal areas of destination during 1972-74 follow:

| Destination | Exports (thousand 42-gallon barrels) | | |
|---|---|---|---|
| | 1972 | 1973 | 1974 |
| Western Hemisphere: | | | |
| Canada | 152,124 | 136,915 | 105,580 |
| Puerto Rico | 97,864 | 93,005 | 59,608 |
| Trinidad and Tobago | 14,538 | 12,933 | 6,118 |
| United States | 543,775 | 656,609 | 601,694 |
| Other | 160,932 | 160,872 | 137,782 |
| Total Western Hemisphere | 969,228 | 1,060,334 | 910,782 |
| Eastern Hemisphere: | | | |
| Western Europe: | | | |
| European Community (EC) | 49,014 | 48,559 | 84,936 |
| Spain | 12,854 | 10,476 | 10,678 |
| United Kingdom | 49,103 | 41,516 | -- |
| Other | 25,339 | 19,681 | 11,486 |
| Total | 136,310 | 120,232 | 107,100 |
| Other Eastern Hemisphere | 23,186 | 50,975 | 49,037 |
| Total Eastern Hemisphere | 159,496 | 171,207 | 156,137 |
| Grand total | 1,128,724 | 1,231,541 | 1,066,919 |

Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta, Año 1972, 1973, 1974. Caracas, Venezuela, March 1973, March 1974, and March 1975.

### Table 2.—Venezuela: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys: | | | |
| Scrap | -- | 611 | Peru 345; Colombia 266. |
| Unwrought | 7,400 | 10,477 | Colombia 5,711; Peru 2,818. |
| Semimanufactures | 889 | 407 | Colombia 227; Italy 115. |
| Antimony metal including alloys, all forms | 3 | -- | |
| Copper metal including alloys: | | | |
| Scrap | -- | 1,355 | Spain 755; United States 600. |
| Semimanufactures | 12 | 439 | Netherlands 424. |
| Iron and steel: | | | |
| Ore and concentrate thousand tons | r16,509 | 21,500 | United States 13,476; West Germany 2,516; United Kingdom 1,845; Italy 1,683. |
| Metal: | | | |
| Pig iron, ferroalloys, and similar materials | -- | NA | |
| Steel, primary forms | 247,503 | | |
| Semimanufactures | 8,809 | | |
| Zinc: | | | |
| Oxide | 20 | -- | |
| Metal: | | | |
| Scrap | -- | 25 | All to Belgium-Luxembourg. |
| Unwrought | 51 | -- | |
| Semimanufactures | 12 | 33 | Brazil 24; Netherlands Antilles 9. |
| Other: | | | |
| Ash and residue containing nonferrous metals, n.e.s | 379 | 122 | All to Belgium-Luxembourg. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | -- | 6 | United States 4; Colombia 2. |

See footnotes at end of table.

## Table 2.—Venezuela: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Other—Continued | | | |
| Metals including alloys, all forms, n.e.s | 86 | -- | |
| NONMETALS | | | |
| Abrasives, natural: | | | |
| Pumice, emery, natural corundum etc | -- | 22 | All to Trinidad and Tobago. |
| Grinding and polishing wheels and stones, n.e.s ____ kilograms | 333 | 2,550 | Trinidad and Tobago 2,366. |
| Cement, hydraulic | 187,538 | 131,678 | Surinam 41,690; United States 35,374; Netherlands Antilles 23,222. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays: | | | |
| Bentonite | -- | 204 | All to Ecuador. |
| Kaolin | 1 | | |
| Other | 204 | 500 | All to Netherlands Antilles. |
| Products: | | | |
| Refractory | 13 | 351 | Ecuador 225; Colombia 104. |
| Nonrefractory | 209 | 780 | Windward Islands 322; Puerto Rico 302. |
| Diamond, gem ____ thousand carats | -- | 535 | Netherlands 270; United States 220. |
| Fertilizer materials, manufactured | 8,449 | 262 | Colombia 253. |
| Gypsum and plasters | 14,830 | 18,600 | Trinidad and Tobago 15,400; Surinam 3,200. |
| Lime | 10 | 9 | All to Netherlands Antilles. |
| Precious and semiprecious stones, except diamond ____ kilograms | 121 | 389 | West Germany 300; United States 43. |
| Sodium and potassium compounds, n.e.s | 7 | 931 | All to Netherlands Antilles. |
| Salt | 35,481 | 11,992 | Trinidad and Tobago 6,190; Guyana 3,143. |
| Stone, sand and gravel: | | | |
| Dimension stone | 2,615 | 1,640 | Netherlands Antilles 919; Trinidad and Tobago 694. |
| Crushed and broken stone for cement and lime manufacture | -- | 178 | Netherlands Antilles 168. |
| Sand | 2,853 | 11,909 | Mainly to Netherlands Antilles. |
| Sulfur: | | | |
| Elemental | 68,512 | 67,963 | Brazil 39,514; Colombia 12,823; Peru 9,088. |
| Sulfuric acid | -- | 30,554 | Mexico 17,589; Trinidad and Tobago 3,870. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | 1,150 | 3,004 | Brazil 1,600; Ecuador 930; Trinidad and Tobago 279. |
| Coal and coke, including briquets | 53 | -- | |
| Natural gas liquids: | | | |
| Natural gasoline thousand 42-gallon barrels | 6,436 | 7,027 | United States 6,212; Brazil 524. |
| Liquefied petroleum gas ___ do | 15,370 | 18,784 | United States 11,560; Mexico 2,037. |
| Hydrogen, helium and rare gases | 16 | 10 | Netherlands Antilles 8; Trinidad and Tobago 2. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 780,471 | 775,092 | United States 247,386; Netherlands Antilles 214,128; Canada 109,312; United Kingdom 31,801. |
| Refinery products: | | | |
| Gasoline ____ do | 1,712 | 430 | United Kingdom 248. |
| Naphtha ____ do | 29,214 | 31,304 | United States 25,746; Netherlands Antilles 3,501. |
| Jet fuel ____ do | 10,983 | 10,347 | United States 8,815. |
| Kerosine ____ do | -- | 1,289 | France 480; United States 325. |
| Distillate fuel oil ____ do | 34,248 | 26,350 | United States 15,315; Canada 1,369. |
| Residual fuel oil ____ do | 266,318 | 314,741 | United States 218,631; Netherlands Antilles 32,791; Canada 12,952. |
| Lubricants ____ do | 2,721 | 3,137 | United Kingdom 1,397; Brazil 161; Peru 118. |
| Asphalt ____ do | 4,722 | 2,386 | United States 2,219. |
| Other ____ do | 2,373 | 2,184 | Argentina 458; Mexico 416; Brazil 387. |
| Total ____ do | 352,291 | 392,168 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 1 | -- | |

r Revised. NA Not available.

[1] All 1972 and 1973 data except that on natural gas liquids, crude petroleum and refinery products, and 1973 iron ore exports and respective destinations were derived from official Venezuelan export statistics. All data for the aforementioned commodities and years were derived from Ministerio de Minas e Hidrocarburos. Memoria y Cuenta 1972, pt. 8, pp. 397–400 and 1973, pt. 9, pp. 451–455.

## Table 3.—Venezuela: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | -- | 2,282 | All from Guyana. |
| Oxide (alumina) and hydroxide | 28,664 | 57,140 | United States 37,931; Jamaica 18,328; Canada 308. |
| Metal including alloys: | | | |
| Unwrought | 60 | 1,874 | All from United States. |
| Semimanufactures | 3,417 | 5,423 | United States 4,115; West Germany 536; France 222. |
| Antimony metal including alloys, all forms | 128 | 11 | Mainly from People's Republic of China. |
| Arsenic trioxide, pentoxide, acids | 39 | 82 | France 28; People's Republic of China 24; United States 17. |
| Chromium: | | | |
| Chromite | r 6 | 6 | All from United States. |
| Oxide and hydroxide | -- | 54 | United States 26; West Germany 14; Italy 5. |
| Cobalt, oxide and hydroxide | -- | 3 | Mainly from Belgium-Luxembourg. |
| Copper: | | | |
| Copper sulfate | 121 | 162 | U.S.S.R. 60; West Germany 59; Belgium-Luxembourg 21. |
| Metal including alloys: | | | |
| Scrap | -- | (1) | All from West Germany and United States. |
| Unwrought | 265 | 422 | West Germany 302; Canada 52; Belgium-Luxembourg 50. |
| Semimanufactures | 10,471 | 9,752 | United States 3,333; Belgium-Luxembourg 2,028; Canada 1,978. |
| Gold metal, unworked or partly worked troy ounces | r 140,595 | 48,322 | Mainly from United States. |
| Iron and steel: | | | |
| Ore and concentrate | 85 | 30 | All from United States. |
| Metal: | | | |
| Scrap | 292,437 | 69,597 | Mainly from United States. |
| Pig iron, ferroalloys, similar materials | 33,602 | 148,681 | Brazil 105,086; Czechoslovakia 28,462; Poland 9,204. |
| Steel, primary forms | 1,014 | 10,287 | Mainly from Japan. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 42,556 | 165,057 | United States 62,453; West Germany 39,706; Japan 17,926. |
| Universals, plates, and sheets: | | | |
| Uncoated | 367,872 | 182,101 | Japan 132,452; Belgium-Luxembourg 13,330; West Germany 12,727. |
| Coated | 133,364 | 385,907 | Japan 225,437; United States 55,354; France 24,914. |
| Hoop and strip | 3,923 | 3,605 | United States 1,148; Japan 863; United Kingdom 681. |
| Rails and accessories | 3,201 | 5,972 | Mainly from United States. |
| Wire | 60,592 | 49,063 | West Germany 16,847; United States 12,892; Belgium-Luxembourg 12,225. |
| Tubes, pipes, fittings | r 33,119 | 29,133 | United States 13,945; West Germany 5,326; Japan 3,649. |
| Castings and forgings, rough | NA | 1,792 | Mainly from United States. |
| Other | 2,055 | 1,624 | United States 842; Canada 181; United Kingdom 180. |
| Ingots and semimanufactures, alloy steel and high carbon | NA | 22,195 | United States 10,133; Japan 7,093; Argentina 1,043. |
| Lead: | | | |
| Oxides | 194 | 879 | Mainly from Mexico. |
| Metal including alloys, all forms | 3,646 | 5,247 | United States 1,961; Mexico 1,774; Panama 399. |
| Magnesium metal including alloys, all forms | -- | 300 | Mainly from United States. |
| Manganese oxides | 981 | 2,772 | Norway 1,500; Mexico 709; United States 539. |
| Mercury 76-pound flasks | 156 | 67 | United States 26; Spain 13; Netherlands 8. |
| Nickel metal including alloys, all forms | 113 | 80 | United States 30; Canada 19; West Germany 16. |
| Platinum-group metals including alloys, all forms troy ounces | 2,604 | 48,869 | Spain 24,627; Italy 12,989; United States 10,095. |
| Silver metal including alloys do | 393,975 | 378,896 | United States 200,556; West Germany 97,352; Italy 35,591. |

See footnotes at end of table.

## Table 3.—Venezuela: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Tin: | | | |
| Oxides ---------- long tons -- | NA | 4 | United States 2; West Germany 2. |
| Metal including alloys, all forms do ---- | 207 | 297 | Brazil 84; United Kingdom 66; Indonesia 50. |
| Titanium oxide ---------- | r 6,319 | 4,157 | West Germany 791; Belgium-Luxembourg 604; Finland 586. |
| Tungsten metal including alloys, all forms ---------- | -- | 2 | Mainly from United States. |
| Uranium metal including alloys, all forms ---------- kilograms -- | -- | 5,859 | Mainly from Brazil. |
| Zinc: | | | |
| Oxides ---------- | 697 | 918 | Netherlands 251; West Germany 173; Mexico 112. |
| Metal including alloys: | | | |
| Scrap and blue powder ----- | -- | 374 | Mainly from Peru. |
| Unwrought ---------- | 11,062 | 15,541 | Canada 4,272; U.S.S.R. 2,746; France 1,840. |
| Semimanufactures ---------- | 557 | 186 | Belgium-Luxembourg 100; United States 34; North Korea 25. |
| Other: | | | |
| Ore and concentrate ---------- | 443 | 519 | United States 285; West Germany 110; Australia 107. |
| Ash and residue containing nonferrous metals ---------- | 2,714 | 1,570 | United States 889; Puerto Rico 297; Dominican Republic 121. |
| Oxides, hydroxides, and peroxides of metals, n.e.s ---------- | NA | 89 | United States 31; Norway 21; West Germany 15. |
| Metals including alloys, all forms - | 243 | 307 | United States 218; Norway 35; Italy 20. |
| NONMETALS | | | |
| Abrasives, natural n.e.s.: | | | |
| Pumice, emery, natural corundum, etc ---------- | 633 | 401 | Canada 137; Italy 102; United States 54. |
| Grinding and polishing wheels and stones ---------- | 510 | 368 | Norway 93; Switzerland 74; Austria 68. |
| Asbestos ---------- | 6,692 | 8,626 | Canada 5,523; Africa (country not specified) 2,638; Mozambique 339. |
| Barite ---------- | 29,463 | 54,003 | Peru 26,968; Brazil 22,257; United Kingdom 4,711. |
| Boron materials: | | | |
| Crude natural borates ---------- | -- | 241 | Mainly from United States. |
| Oxide and acid ---------- | 369 | 306 | Do. |
| Salts ---------- | 1,734 | 1,246 | United States 559; United Kingdom 460; Belgium-Luxembourg 191. |
| Cement ---------- | 1,245 | 1,840 | West Germany 1,011; United States 571; France 247. |
| Chalk ---------- | (1) | 90 | All from Belgium-Luxembourg. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite ---------- | 11,128 | 14,299 | Mainly from United States. |
| Fuller's earth ---------- | 92 | 65 | United States 44; United Kingdom 21. |
| Kaolin ---------- | 10,311 | 17,824 | Mainly from United States. |
| Other clays and earth ------ | 14,575 | 7,279 | United States 3,832; Guyana 3,158; Italy 90. |
| Products: | | | |
| Refractory (including nonclay bricks) ---------- | 1,666 | 2,039 | Mainly from United States. |
| Nonrefractory ---------- | 891 | 1,529 | Italy 869; Colombia 286; Japan 107. |
| Cryolite and chiolite ---------- | 1,386 | 2,483 | Mainly from United States. |
| Diamond, industrial thousand carats -- | 65 | 30 | Do. |
| Diatomite and other infusorial earth - | 2,553 | 3,591 | United States 2,003; Mexico 1,491; Japan 43. |
| Feldspar ---------- | 680 | 76 | Mainly from United States. |
| Fertilizer materials: | | | |
| Crude ---------- | 10 | (1) | All from United States. |
| Manufactured: | | | |
| Nitrogenous ---------- | 71,644 | 49,194 | Belgium-Luxembourg 16,550; United States 10,200; West Germany 10,046. |
| Phosphatic ---------- | -- | 13,702 | Mainly from West Germany. |
| Potassic ---------- | 8,799 | (1) | Do. |
| Other, including mixed ------ | r 51 | 6 | West Germany 3; United States 2; Netherlands 1. |

See footnotes at end of table.

## Table 3.—Venezuela: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fluorspar | 725 | 3,492 | Mainly from Mexico. |
| Graphite, natural | 251 | 225 | Mainly from United States. |
| Gypsum and plasters | 429 | 418 | United States 158; West Germany 140; United Kingdom 119. |
| Iodine | 5 | 5 | United States 2; West Germany 1; Spain 1. |
| Lime | (1) | 86 | West Germany 50; United States 36. |
| Magnesite | 6 | 23 | Austria 17; United States 6. |
| Mica: | | | |
| Crude, including splittings and waste | 479 | 380 | Mainly from United States. |
| Worked, including agglomerated splittings | 4 | 6 | United States 2; West Germany 2; Italy 1. |
| Pigments, mineral: | | | |
| Natural, crude | 47 | 109 | Mainly from United Kingdom. |
| Iron oxides, processed | 372 | 622 | West Germany 291; Spain 106; United Kingdom 92. |
| Precious and semiprecious stones, except diamond, natural and synthetic: | | | |
| Uncut kilograms | 191 | 6,314 | Brazil 4,059; United States 806; Mexico 769. |
| Cut do | 359 | | |
| Pyrite | -- | 19 | All from United States. |
| Salt | 39 | 35 | Mainly from United States. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 27,514 | 24,706 | Do. |
| Caustic potash, sodic and potassic peroxides | (2) | 353 | Do. |
| Soda ash | 42,294 | 27,272 | Do. |
| Stone, sand and gravel: | | | |
| Dimension stone, crude and worked | r 4,176 | 4,128 | Italy 2,372; Norway 335; Portugal 123. |
| Gravel and crushed stone | 42,662 | 37,424 | Mainly from United States. |
| Dolomite, chiefly refractory grade | -- | 393 | United States 201; Italy 152; Norway 40. |
| Quartz | 19 | 109 | United States 58; Yugoslavia 40; Netherlands 3. |
| Sand | 429 | 627 | France 406; Spain 168; United States 52. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 30 | 247 | Belgium-Luxembourg 116; United States 96; West Germany 35. |
| Colloidal | 801 | 422 | Belgium-Luxembourg 209; United States 119; West Germany 84. |
| Sulfur dioxide | 91 | 165 | Mainly from United States. |
| Sulfuric acid | 10,357 | 34 | West Germany 14; Sweden 7; Italy 4. |
| Talc and steatite | 7,309 | 7,051 | United States 3,326; Italy 2,189; People's Republic of China 1,040. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Vermiculite | 426 | 324 | Africa (country not specified) 200; Mozambique 95. |
| Mineral substance, n.e.s | 1,116 | 309 | Italy 260. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 1,368 | 767 | United States 684. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 14 | 52 | United States 46; West Germany 5. |
| Carbon black | 597 | 477 | Canada 178; United States 135. |
| Coal, all grades, including briquets | 180,587 | 60,192 | Japan 34,883; United States 24,314. |
| Coke and semicoke of coal and lignite | 170,806 | 334,000 | Japan 179,928; West Germany 82,358. |
| Natural gas liquids: | | | |
| Natural gasoline 42-gallon barrels | 162 | -- | |
| Other do | 58 | 10 | United States 8. |
| Petroleum: | | | |
| Crude and partly refined do | (1) | 579 | United States 386; Italy 143. |

See footnotes at end of table.

Table 3.—Venezuela: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum—Continued | | | |
| Refinery products: | | | |
| Gasoline - 42-gallon barrels | 43,092 | 13 | All from United States. |
| Jet fuel ---------- do | (1) | -- | |
| Kerosine ---------- do | 765 | 600 | Netherlands 432; United States 168. |
| Distillate fuel oil --- do | (1) | 80 | All from United States. |
| Lubricants ---------- do | 40,793 | 15,913 | United States 12,130. |
| Other: | | | |
| Solvents ---------- do | 11,993 | 802 | United States 778. |
| Paraffin ---------- do | 26,807 | 9,587 | Colombia 5,117; Japan 3,328. |
| Mineral jelly and wax (including petrolatum) do | r 11,285 | 5,933 | United States 4,407; West Germany 661. |
| Unspecified ------ do | r 157,291 | 68,679 | United States 53,885. |
| Mineral tar and other coal-, petroleum- or gas-derived crude chemicals | 16,129 | 22,412 | United States 18,438; Curaçao 1,502. |

r Revised. NA Not available.
1 Less than ½ unit.
2 Revised to none.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Three major aluminum development projects were underway in Venezuela during 1974, but two were combined by yearend. All of the projects were part of a national effort to increase aluminum production nearly ten-fold, to about 470,000 tons per year, by 1981.

The largest aluminum project envisions a 280,000- to 350,000-ton-per-year smelter near Puerto Ordaz in the Guayana District of northeastern Venezuela. This project merges two previously separate Venezuelan-Japanese construction schemes for aluminum smelters in the district. Project operations will be implemented by a joint company, Industria Venezolana de Aluminio (New Venalum). The company consists of Corporación Venezolana de Guayana (CVG), an entity with 80% government ownership; Showa Denko K.K., 7%; Kobe Steel, Ltd., 4%; Mitsubishi Heavy Industries Ltd., 4%; Sumitomo Chemical Co., Ltd., 4%; and Marubeni Corporation, 1%. The proposed smelter, estimated to cost over $300 million, is expected on-stream by 1977 with an initial capacity of 70,000 tons per year. The plant reportedly will include aluminum-casting and hot-rolling facilities. Reynolds Metals Co. is providing technical assistance for construction, which reportedly was underway by yearend. Part of the alumina feed for the smelter will be provided by the Aluminum Co. of America (Alcoa) from its Surinam sources. However, the Government also hopes to find and utilize domestic bauxite supplies. Power for the smelter will come from the Government hydroelectric project on the Caroní River northeast of El Manteco.

At yearend, the Ministry of Mines and Hydrocarbons was planning to initiate a program to study the possibility of aluminum production in Bolivar State. The study will concern various nonconventional extraction methods, as well as the Bayer and Pedersen processes.

**Copper, Lead, and Zinc.**—During 1974, the government-owned Corporación de los Andes, two Japanese companies (Dowa Mining Co., Ltd., and Nissho-Iwai Co., Ltd.), and private Venezuelan interest together planned to develop copper-lead-zinc deposits near Bailadores in Mérida State. The deposits reportedly contain up to 2.5 million tons of ore grading 1.5% copper, 7% lead, and 26% zinc. The public and private firms own 70% of the project while the Japanese companies own 15% each. If the conclusions of a 1974 feasibility study are favorable, the Government will consider the construction of a 33,000-ton-per-year zinc smelter. Production is expected to commence in 1975 and reach an annual rate of 20,000 tons by 1978 with later expansion to 35,000 tons.

**Gold.**—During 1974, Nord Canamerex Partnership, an affiliate of Nord Resources Corp. (a U.S. firm), reportedly had nearly completed a combination gravity-flotation mill at its Nueva Corazon de Jesus property in the El Dorado District. The com-

pany had expected the mill to begin processing 75 tons of ore per day by yearend. Construction of the mill followed exploration that revealed a gold-bearing quartz vein over 30 meters deep, about 250 meters in strike length, and approximately 1 meter in average width. Assays vary from a trace to 8.4 ounces of gold per ton, and average about 1.5 ounces per ton. Additional exploration is planned for the 5-square-kilometer property and surrounding concessions.

Also during the year, the Ministry of Mines and Hydrocarbons Technology Mining Research Laboratory carried out a study regarding the recovery of other valuable metals from gold tailings at the El Peru gold mines in Venezuelan Guayana. The Ministry estimates that there are approximately 3 million tons of tailings in the treatment plant dumps with tenors ranging from 0.1% to 0.4% wolfram oxide. Preliminary testing indicated tenors ranging from 1 to 4 grains per ton, with a possible recovery of 80%.

**Iron and Steel.**—Iron ore output increased by 14% to a record high of over 26 million tons in 1974. Crude steel output rose to slightly more than 1 million tons during the year.

Almost all of Venezuela's iron ore output was accounted for by the Orinoco Mining Co. (a subsidiary of the United States Steel Corp.) which produced 84%, and Iron Mines Co. of Venezuela (a subsidiary of Bethlehem Steel Corp.) which produced 15%. The remaining output was produced at the San Isidro deposits near Ciudad Piar. Nearly all of the output was exported, primarily to the United States, which received 63% of the total. Domestic consumption was by Siderúrgica del Orinoco S.A. (SIDOR), a subsidiary of CVG that obtains the bulk of its iron ore supply from the San Isidro deposits.

The Orinoco Mining Co. and Iron Mines Co. of Venezuela were nationalized at yearend. The Government reportedly paid a total of $100 million compensation to the parent companies. Payments are to be made quarterly in Government bonds over a 10-year period at 7% annual interest. Bethlehem Steel Corp. and United States Steel Corp. personnel will remain in Venezuela to provide management and technical assistance during a transition period of at least 1 year's duration.

A series of work stoppages occured at the Orinoco Mining Co. and Iron Mines Co. of Venezuela during October and November 1974. Strike action reportedly was taken by workers to support wage claims and insure that their retirement rights would be retained following nationalization of the industry. The workers returned to the mines after government assurances that employee rights were explicity guaranteed under the impending nationalization.

During the year, the Government proceeded with its $2.6 billion plan to expand steel industry capacity from an existing 1.3 million tons per year to a projected 5.0 million tons per year by 1978. Supplemental expansion to 10 million tons per year is expected by 1980, followed by an additional 5-million-ton-capacity increase by 1985. The expansion program, which emphasizes utilization of electric furnaces and direct reduction smelting processes, is under the auspices of the state-controlled CVG in association with foreign and domestic private capital. The expansion plan envisions greater domestic resource development and is designed to diversify Venezuela's exports and reduce its heavy dependence on petroleum. The first stage of the plan involves expansion of existing facilities, mainly those of SIDOR.

A three-stage investment program planned by the privately owned Siderúrgica Venezolana, S.A. (SIVENSA) will involve erection of an electric steelmaking plant, installation of a continuous casting system for billet production, and a construction of a 720,000-ton-per-year pelletizing plant, and a direct reduction plant. Completion of these facilities will result in a total production of 475,000 tons of steel and 225,000 tons of billets.

**Nickel.**—Development activity at the Loma de Heiro ferronickel deposit was limited. The ore body located in the States of Araqua and Miranda was estimated at 55 million tons of 1.65% contained nickel ore. It was estimated that an investment of $90 million would be required to process 10,000 tons of nickel per year.

**Silicon.**—Nobel-Bozel (France), CVG, and private Venezuelan interests formed a joint-venture group to construct a ferrosilicon plant in Mantanzas at a cost of about $22 million to produce 55,000 tons by 1977. Nobel-Bozel will own 50% of the plant, and CVG and private investors will divide the remaining shares.

**Titanium.**—In early 1974, the Ministry of Mines and Hydrocarbons completed geophysical surveys of titanium-bearing areas in the State of Yaracuy. Following the surveys, which were part of a program begun in 1972, the Ministry began exploration drilling to establish reserve estimates. Based on these estimates, the Ministry will proceed with studies to determine the commercial feasibility of mining the titanium ore.

## NONMETALS

**Cement.**—During 1974, C.A. Venezolana de Cementos, the country's largest cement producer, completed its 1,800,000-ton-per-year, computer-operated cement plant in Anzoategui State at a cost of $41 million. The company also planned to enlarge the output of its Barquisimeto plant and expected to construct a plant in Maracaibo and another in Pertigalete with annual capacities of 750,000 tons and 2 million tons, respectively.

**Feldspar.**—During 1974, the Ministry of Mines and Hydrocarbons undertook studies for creating incentives to increase domestic feldspar production. The efforts to increase production are part of a program designed to stimulate economic development as well as supply more domestic raw materials for Venezuelan industry.

**Fertilizer Materials.**—Despite delays arising from shortages of materials and trained manpower, Venezuela's mineral fertilizer industry made several gains during 1974. The industry is being expanded under a government program designed to make the country self-sufficient in, and an exporter of fertilizer products.

The second ammonia plant and the second urea plant at the El Tablazo petrochemical complex in Zulia State began production in 1974. These plants complete a $200 million petrochemical fertilizer project of two ammonia plants and two urea plants designed to produce a total of 594,000 tons of ammonia and 792,000 tons of urea yearly. The plants are operated by Venezolano del Nitrogeno C.A. (NITROVEN), a joint-venture firm owned 90% by the Governmental Instituto Venezolano de Petroquimica (I.V.P.) and 10% by Petroquimica del Atlantico of Colombia. All production is scheduled for foreign markets. Contracts for shipments reportedly have been concluded with the United States, Brazil, Mexico, and the People's Republic of China.

Planning for an additional ammonia production facility at El Tablazo also was underway during 1974. The plant will have a capacity of 600,000 tons per year, all for export, and was scheduled for completion in late 1975. Plant operations are to be conducted by Marammonia C.A., a joint-venture company composed of I.V.P. (51%) and Grupo Internacional Transammonia de USA (49%).

Also in 1974, the Government negotiated several joint-venture fertilizer production schemes with foreign investors. Occidental Petroleum Corp., (a U.S. company) and I.V.P. discussed the formation of a company to produce ammonia and urea. In addition, Snam Auxini Projectos (Spain) was awarded a contract to install a rock phosphate processing plant at Morón in Carabobo State.

**Talc.**—During 1974, the Ministry of Mines carried out an evaluation of talc deposits in southern Yaracuy State. The deposits constitute one of the major talc and soapstone deposits in northern Venezuela. Results of the Government evaluation were very promising in regard to commercial possibilities for the deposits.

## MINERAL FUELS

**Coal.**—During 1974, Corporación Desarrollo de la Region Zuliana (CORPOZULIA), a governmental agency, was engaged in a $1 million feasibility study of the Guasare coal deposits in the State of Zulia. The Government envisions production of 6 to 10 million tons of coal yearly from the Guasare deposits, which are estimated to contain about 800 million tons of reserves. CORPOZULIA officials indicate that the Guasare coal could fulfill the requirements of Venezuela's steel industry indefinitely. The Government announced during 1974 that neither Guasare coal nor the Naricual coal deposits in Anzoátegui State would be developed with private capital.

Also in 1974, the Government established a National Coal Commission subordinate to the Ministry of Mines and Hydrocarbons. The Commission is to control, coordinate, and formulate requirements for development of the coal mining industry.

**Petroleum and Natural Gas.**—Crude oil production decreased to an average of

2,976,255 barrels per day during 1974 in response to market factors and Government efforts to conserve the country's remaining petroleum resources. This output represented a 12% annual decrease and was the lowest production level in 12 years. Medium crudes (22.1° to 30° API), light crudes (over 30° API), and heavy crudes (under 22.1° API, accounted for 38%, 33%, and 29% of total output, respectively.

**Table 4.—Venezuela: Salient statistics of the petroleum and natural gas industry**

| | 1972 | 1973 | 1974 p |
|---|---|---|---|
| Crude oil: | | | |
| Production ---- thousand 42-gallon barrels -- | r 1,178,489 | 1,228,596 | 1,086,333 |
| Processed at refineries ---- do ---- | 411,828 | 474,387 | 435,492 |
| Exports [1] ---- do ---- | 780,471 | 775,092 | 646,916 |
| Natural gas: | | | |
| Production ---- million cubic feet -- | r 1,625,173 | 1,745,702 | 1,639,511 |
| Sales ---- do ---- | 150,513 | 194,656 | 209,559 |
| Producers' fuel ---- do ---- | 185,828 | 204,509 | 201,225 |
| Shrinkage due to extraction of natural gas liquids ---- do ---- | 51,383 | 60,777 | 65,191 |
| Field injection ---- do ---- | 724,452 | 769,514 | 815,282 |
| Flared or otherwise lost ---- do ---- | 513,021 | 516,270 | 348,277 |
| Natural gas liquids: | | | |
| Production ---- thousand 42-gallon barrels -- | 29,498 | 32,508 | 30,596 |
| Exports ---- do ---- | 21,806 | 25,811 | 22,174 |
| Refinery products: | | | |
| Refinery output [2] ---- do ---- | 412,663 | 476,842 | 436,539 |
| Consumption ---- do ---- | 65,081 | 71,622 | 71,807 |
| International bunkers ---- do ---- | 18,400 | 20,180 | 18,637 |
| Exports ---- do ---- | 352,291 | 392,168 | 353,172 |

p Preliminary. r Revised.
[1] Includes refined or partly refined products blended with crude oil.
[2] Includes refinery fuel.

Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta, Año 1972, 1973, 1974. Caracas, Venezuela, March 1973, March 1974 and March 1975.

Natural gas production, nearly all from oilfields, accompanied the decline in oil output by decreasing 6% during 1974. However, the ratio of gas to oil output increased to 1,509 cubic feet of gas for each barrel of oil produced.

The capacity of natural gas injection facilities increased 146 million cubic feet daily to a total of 4,079 million cubic feet per day in 1974. Gas injection during the year was at a daily rate of 2,233 million cubic feet. Water injection capacity rose 160,444 barrels per day to a total of 3,154,009 barrels daily by yearend 1974, and the average injection rate during the year was 2,037,807 barrels per day.

The total length of crude oil and natural gas pipelines in service increased 23 and 79 kilometers, respectively, during 1974, but refined product lines remained the same. Data on the length of pipelines in operation at yearend were as follows:

| Type of line | Total length (kilometers) |
|---|---|
| Crude oil: | |
| Trunk | 3,359 |
| Secondary | 2,869 |
| Total crude oil | 6,228 |
| Refined products | 512 |
| Natural gas | 3,058 |
| Grand total | 9,798 |

Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta, Año 1974. Caracas, Venezuela, March 1975.

Proved reserves of crude oil increased by about 4,621 million barrels to a reported total of 18,568 million barrels at yearend 1974. As of the same date, natural gas reserves totaled 38,308 billion cubic feet, approximately 430 million cubic feet more than the revised 1973 yearend figure of 38,308.4 billion cubic feet. The increase in both oil and gas reserves resulted primarily from the upward revision of the

quantities recoverable from producing fields. Approximately 97% of total proved gas reserves at the end of 1974 was accounted for by dissolved and associated gas.

Geophysical exploration, exploration development, and injection drilling activities during 1974 were as follows:

| | | 1972 | 1973 | 1974 |
|---|---|---|---|---|
| Geophysical exploration: | | | | |
| Gravimetric and magnetic surveying | party months | 3.0 | -- | .9 |
| Seismic surveying | do | 33.0 | 28.8 | 38.5 |
| Structural drilling | do | 5.2 | 8.1 | 21.1 |
| Total | do | 41.2 | 36.9 | 60.5 |
| Drilling: | | | | |
| Wells drilled: | | | | |
| Exploratory: | | | | |
| Oil [1] | number | 117 | 103 | 127 |
| Dry | do | 53 | 45 | 38 |
| Total exploratory wells | do | 170 | 148 | 165 |
| Development: | | | | |
| Oil | do | 318 | 261 | 235 |
| Dry | do | 11 | 12 | 7 |
| Total development wells | do | 329 | 273 | 242 |
| Injection | do | 27 | 7 | 6 |
| Total wells drilled | do | 526 | 428 | 413 |
| Footage drilled | thousand feet | 3,585 | 3,281 | 3,374 |

[1] May include wells in which both crude oil and nonassociated natural gas were discovered in separate zones.

Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta, Año 1972, 1973, 1974. Caracas, Venezuela, March 1973, March 1974 and March 1975.

During 1974, the Ministry of Mines and Hydrocarbons completed 32 stratigraphic wells in the Orinoco Oil Belt and announced that it had completed most of its seismographic studies in the area. The studies indicated thicker-than-anticipated, oil-bearing formations and the extension of the belt farther south, toward the Orinoco River. Moreover, new data released by the Ministry during 1974 indicated that the belt contains some light oil as well as the known deposits of very heavy crude. The Government also held discussions with several foreign interests during the year concerning mutual development of the belt, including the construction of a special refinery to process heavy crude oil.

In November 1974, the National Petroleum Reversion Commission appointed by President Pérez completed its 6-month deliberations on the nationalization of the petroleum industry. On December 23, the Commission presented the President with a draft nationalization bill for the Venezuelan Congress and a series of reports on the technical, administrative, and legal aspects of nationalization. At yearend, the President and his administration were studying the bill in preparation for its submission to Congress for enactment in 1975.

The nationalization bill establishes a timetable of 120 days for termination of all private oil concessions after it becomes law. However, indemnification will be paid to the oil companies based on the Government's net book valuation of nationalized assets. Moreover, the bill reportedly will permit Government and private industry partnerships in oil industry operations.

During 1974, the Ministry of Mines and Hydrocarbons planned a major investment program totaling $920 million to upgrade the existing 1.6 million-barrel-per-day refining capacity in the country. The program was scheduled to begin in 1975 and continue through 1980. The objective of the program is the installation of new processes that will maximize yields of higher profit products.

In October 1974, the Government announced its intention to acquire 23 oil tankers within the next decade for the

formulation of a national petroleum fleet. Seven of the tankers, each with a displacement of 60,000 deadweight tons, were to be acquired by mid-1975 at a cost of nearly $200 million. The fleet is scheduled to transport 50% of Venezuela's crude oil exports by 1985.

A total of 18 petroleum tanker terminals were active in the exportation of crude oil and refinery products during 1974. Of these, the three terminals operated by Creole Petroleum Corp. accounted for 41% of all shipments and the five operated by Cia. Shell de Venezuela, Ltd., loaded 30%.

During 1974, the Government postponed indefinitely a $300 million construction project for facilities near Maracaibo to produce and export liquefied natural gas (LNG) to the United States. Two other projects directly concerning the United States were under consideraion late in the year: (1) Construction of a refinery in the State of Mississippi to process Venezuelan crude, and (2) construction of a 2,800-mile natural gas pipeline from Maracaibo to Texas.

On February 7, 1974, a power failure closed a Shell Oil Co. refinery at Punta Cardón, and a fire interrupted operations of a Gulf Oil Co.-Texaco Inc. refinery at Puerto La Cruz. The two incidents were unrelated as well as accidental, and both refineries were operating at full capacity by March.

In 1974, the Government announced that it was planning to take part of its petroleum royalty payments in oil, rather than cash. The payments in kind, amounting to approximately 100,000 barrels per day, are intended for three purposes: (1) to supply Latin American countries that have petroleum shortages, (2) to sell in wider world markets, and (3) to exchange for critically needed raw materials.

At yearend 1974, the Government reportedly was considering the purchase of at least part ownership of both the Shell Oil Co. refinery and the Exxon Corp. refinery in the Netherlands Antilles. Government officials did not confirm the report, however.

A computerized data bank for oil and natural gas wells began operating in 1974 under the aegis of the Ministry of Mines and Hydrocarbons. Selected digitized profiles of all wells drilled in the country will be entered in the computer storage system by 1977.

In addition to the projects noted under "Fertilizer Materials," 17 additional production facilities were contemplated or under construction during 1974 at the El Tablazo and Morón petrochemical complexes. These facilities will manufacture an array of products including low- and high-density polyethylene, vinyl acetate, isopropanol, acrilonitrile, polypropylene, sodium tripolyphosphate, and polyvinyl chloride. Although several foreign companies have made investments, the majority of these enterprises will be owned by IVP or private Venezuelan companies.

The basic infrastructure of the El Tablazo complex was nearly complete by yearend 1974. Infrastructure elements included docking facilities, a thermoelectric plant with a substation, electric distribution lines, liquids and gas handling facilties, effluent treatment installations, and an olefin and liquefied gas plant. Most derivative or satellite plants and downstream production facilities are in the planning stage only.

In addition to El Tablazo and Morón, other parts of the country were scheduled for petrochemical projects during 1974. Venezuelan and Romanian representatives together prepared plans for the installation of a $20 million soda ash plant at Cumaná in Sucre State. In addition, Química Venoco, a Venezuelan concern, planned to invest about $4 million to expand lubricating oil and grease production at Guacara in Carabobo State.

Special emphasis was placed on projects concerning the synthesis of food products from hydrocarbons. IVP (50% ownership), British Petroleum Co., Ltd. (20%), and two consumer cooperatives (15% each) agreed to construct a $100 million plant at Puerto La Cruz in Anzoátegui State to convert paraffin waxes into animal feed at a rate of 100,000 tons per year beginning in 1978. Italian investors reportedly submitted plans to the Government for a similar plant on the Península de Paraguaná. In addition, the Ministry of Mines and Hydrocarbons contracted with Batelle Memorial Institute, C.A., to prepare a feasibility study for the manufacture of high-protein food from petroleum.

Early in 1974, Pérez administration representatives met with officials from Cuba to discuss resumption of petroleum, natural gas, or petrochemical sales to the island. By yearend, however, no trade policy change toward Cuba had been promulgated by the Government.

## Table 5.—Venezuela: Distribution of landholdings, crude oil production, and refining capacity, by company, 1974

| Company | Principal ownership or affiliation | Nationality of ownership | Concessions [1] and assignations [2] as of Dec. 31, 1974 (hectares) | Crude oil production (thousand 42-gallon barrels) | Refining capacity as of Dec. 31, 1974 (thousand 42-gallon barrels daily) |
|---|---|---|---|---|---|
| PRIVATE | | | | | |
| Amoco Venezuelan Oil Co | Standard Oil Co. (Indiana). | United States | 5,500 | 9,855 | -- |
| Caracas Petroleum, S.A. | Ultramar Co., Ltd. | British | 26,712 | 2,916 | -- |
| Charter Venezuelan Petroleum Co. | Charter Oil Co | United States | 7,000 | 4,427 | -- |
| Chevron Oil Co. de Venezuela S.A. | Standard Oil Co. of Calif. | do | 69,688 | 17,650 | 62 |
| Cia. Shell de Venezuela, Ltd | Royal Dutch/ Shell Group. | British/Dutch | 295,680 | 249,586 | 404 |
| Continental Oil Co. of Venezuela. | Continental Oil Co. | United States | 797 | 3,017 | -- |
| Coro Petroleum Co | Texaco, Inc | do | 45,508 | 1,662 | -- |
| Creole Petroleum Corp | Exxon Corp | do | 574,472 | 488,777 | 740 |
| International Petroleum (Venezuela), Ltd. | do | do | 6,133 | 1 | -- |
| Mene Grande Oil Co., C.A. | Gulf Oil Corp | do | 593,748 | 147,582 | -- |
| Mito Juan Concesionaria de Hidrocarburos, C.A. | Venezuelan investors. | Venezuelan | 33,775 | 2,847 | -- |
| Mobil Oil de Venezuela | Mobil Oil Corp | United States | 144,054 | 22,895 | 106 |
| Phillips Petroleum Co | Phillips Petroleum Co. | do | 39,447 | 15,311 | 4 |
| Sinclair Venezuela Oil Co | Atlantic Richfield Co. | do | 20,416 | 8,983 | 45 |
| Sociedad Anónima Petrolera Las Mercedes. | Texaco, Inc., and Ultramar Co., Ltd. | United States/ British. | 89,209 | 900 | -- |
| Talón Petroleum Co., C. A | Kirby Petroleum Co. | United States | 60,167 | 1,380 | -- |
| Texaco Maracaibo, Inc | Texaco Inc | do | 3,147 | 14,940 | -- |
| Texas Petroleum Co | do | do | 105,427 | 13,775 | 10 |
| Venezuelan Atlantic Refining Co. | Atlantic Richfield Co. | do | 19,337 | 877 | -- |
| Venezuelan Gulf Refining Co | Gulf Oil Corp | do | -- | 401 | 159 |
| Venezuelan Sun Oil Co | Sun Oil Co | do | 20,000 | 51,417 | -- |
| Total private companies | | | 2,160,217 | 1,059,199 | 1,530 |
| VENEZUELAN GOVERNMENT | | | | | |
| Corp. Venezolana del Petróleo (C.V.P) | | | 1,186,062 | 27,133 | 25 |
| Grand total | | | 3,346,279 | 1,086,332 | 1,555 |

[1] To private companies.
[2] To the Government.

Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta, Año 1974, Caracas, Venezuela, March 1975.

# The Mineral Industry of Yugoslavia

By Roman V. Sondermayer [1]

Nonferrous ores and metals remained the most significant mineral products of Yugoslavia during 1974. Bauxite, copper, byproduct gold, selenium, germanium, lead, zinc, bismuth, cadmium, silver, mercury, barite, feldspar, cement, coal, petroleum, and pyrite were among the more important minerals produced in the country. However, only bauxite, copper, lead, zinc, and mercury were of world significance. Iron and steel output continued below demand. Consequently, imports of large quantities of iron and steel semimanufactures were required.

Increasing crude oil prices made the use of domestic coal more attractive, and plans for expansion of production were announced. However, most of the domestic coals were brown and lignite, and imports of high-rank coals and coke were necessary. Although crude oil output reached 3.5 million tons, an alltime high, imports were necessary to meet two-thirds of demand.

There were a number of significant developments during 1974. Construction continued on alumina plants in Vlasenica, Bosnia, and alumina and aluminum plants near Mostar, Hercegovina. Production started on a 35,000-ton-per-year plant for production of aluminum rolled products in Sevojno, Serbia. Development continued on the Bučim copper deposit and on the nickel deposit near Rzanovo, both in Macedonia. Westinghouse Electric Corp. started construction on Yugoslavia's first nuclear powerplant located in Krško. Preliminary administrative work was concluded on construction of a crude oil pipeline from the Adriatic to inland refineries in Yugoslavia, Hungary, and Czechoslovakia.

## PRODUCTION

Mineral producers directed their efforts toward modernization of existing facilities and construction of new installations. The aim was to transform the mineral industry from a producer and exporter of ores and concentrates to a producer and exporter of primary metals and semimanufactured products. In addition, efforts were made to reduce the country's dependence on imported energy. Although investments in building new facilities and expanding and renovating existing processing facilities were predominant, a shift continued in channeling available capital toward mine expansion. Shortages of ores and concentrates forced this trend. Mechanization and automation in both mining and processing continued during 1974.

Modern and efficient methods prevailed in petroleum exploration, production, and refining. All three primary methods of oil production—flowing, pumping, and gas lift—were used; dual completion was used at some wells, and secondary recovery at some older fields. Chemical and hydraulic methods for stimulating gas and oil production were everyday practices.

[1] Physical scientist, Division of Nonferrous Metals.

## Table 1.—Yugoslavia: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite, gross weight ---- thousand tons | 2,197 | 2,167 | 2,370 |
| Alumina, gross weight | 126,027 | 274,721 | [e] 300,000 |
| Ingot, including secondary | 72,716 | 90,845 | 147,089 |
| Antimony: | | | |
| Mine output, metal content | 1,975 | 2,055 | [e] 2,034 |
| Metal (regulus) | 1,744 | 1,999 | 2,349 |
| Bismuth, smelter output | 89 | 55 | 100 |
| Cadmium, smelter output [e] | 140 | 140 | -- |
| Chromium, chromite, gross weight | 28,137 | 9,594 | 24,229 |
| Copper: | | | |
| Mine output, metal content | 103,133 | 111,793 | [e] 123,000 |
| Blister: | | | |
| Primary | 149,047 | | [e] 163,200 |
| Secondary | 1,464 | {160,025} | [e] 1,800 |
| Refined (electrolytic): | | | |
| Primary | 128,611 | 133,639 | 139,741 |
| Secondary | 1,363 | 3,841 | 10,265 |
| Gold ---- troy ounces | 136,898 | 176,347 | [e] 177,000 |
| Iron and steel: | | | |
| Iron ore, gross weight ---- thousand tons | 3,960 | 4,671 | 5,034 |
| Pig iron ---- do | 1,819 | 1,955 | 2,126 |
| Ferroalloys ---- do | 131 | 155 | 190 |
| Crude steel ---- do | 2,588 | 2,676 | 2,832 |
| Semimanufactures ---- do | 1,920 | 1,961 | 2,235 |
| Lead: | | | |
| Mine output, metal content | 120,173 | 119,312 | [e] 135,000 |
| Metal: | | | |
| Smelter, crude, including secondary | 102,164 | 112,632 | [e] 125,000 |
| Refined, including secondary | 87,496 | 98,033 | 113,876 |
| Manganese ore and concentrate, gross weight | 15,340 | 9,718 | 13,282 |
| Mercury ---- 76-pound flasks | 16,419 | 15,606 | 15,838 |
| Selenium, elemental ---- kilograms | 40,880 | 42,880 | 45,000 |
| Silver, refined including secondary -- thousand troy ounces | 3,582 | 4,302 | 4,702 |
| Zinc: | | | |
| Mine output, metal content | 96,731 | 97,428 | [e] 169,000 |
| Smelter, including secondary | 48,641 | 63,121 | 86,380 |
| **NONMETALS** | | | |
| Asbestos | 11,040 | 9,391 | 12,247 |
| Barite | 70,528 | 62,053 | 65,000 |
| Cement, hydraulic ---- thousand tons | 5,751 | 6,376 | 6,647 |
| Clays: | | | |
| Crude fire clay | 335,604 | 300,236 | [e] 300,000 |
| Calcined fire clay | 95,750 | 86,247 | [e] 90,000 |
| Feldspar, crude | [r] 33,408 | 37,754 | [e] 40,000 |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous: | | | |
| Gross weight [2] ---- thousand tons | 1,371 | 1,381 | 1,389 |
| Nitrogen content ---- do | 274 | 276 | 278 |
| Phosphatic: | | | |
| Gross weight [2] | [r] 789 | 963 | 818 |
| Phosphorous pentoxide content ---- do | [r] 130 | 159 | 135 |
| Gypsum: | | | |
| Crude | 270,532 | 256,290 | [e] 250,000 |
| Calcined | 82,064 | 72,911 | [e] 75,000 |
| Lime: | | | |
| Quicklime ---- thousand tons | 1,128 | 1,211 | 886 |
| Hydrated ---- do | 585 | 659 | [e] 700 |
| Magnesite: | | | |
| Crude | 421,674 | 383,709 | 464,000 |
| Sintered | 149,335 | 169,709 | 269,029 |
| Caustic calcined | 5,145 | 5,961 | [e] 6,000 |
| Mica, all grades | 126 | 28 | NA |
| Pyrite concentrate: | | | |
| Gross weight | 230,806 | 216,732 | 255,000 |
| Sulfur content [e] | 96,939 | 91,027 | 107,100 |
| Quartz, quartzite, and glass sand | 1,114 | NA | 1,500,000 |
| Salt: | | | |
| Marine | 8,654 | 50,940 | 51,000 |
| From brine [3] | 180,206 | 182,642 | 179,000 |
| Rock | 79,346 | 97,623 | 97,000 |
| Total | 268,206 | 331,205 | 327,000 |
| Sand and gravel (except glass sand) thousand cubic meters | 9,493 | 9,692 | NA |

See footnotes at end of table.

**Table 1.—Yugoslavia: Production of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone (except quartz and quartzite): | | | |
| Dimension: | | | |
| Crude: | | | |
| Ornamental ---- thousand cubic meters | 42 | 43 | NA |
| Other ---- do | 12 | 9 | NA |
| Partly worked facing ---- thousand square meters | 629 | 549 | 592 |
| Cobblestones, curbstones, and others thousand cubic meters | 46 | 37 | NA |
| Crushed and broken, n.e.s ---- do | 6,636 | 6,292 | NA |
| Milled marble and other, n.e.s. ---- do | 2,596 | 2,933 | NA |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | 13,035 | 15,366 | 16,000 |
| Coal: | | | |
| Bituminous ---- thousand tons | 599 | 576 | 601 |
| Brown ---- do | 9,184 | 9,145 | 9,380 |
| Lignite ---- do | 21,157 | 22,729 | 23,601 |
| Total ---- do | 30,940 | 32,450 | 33,582 |
| Coke: | | | |
| Metallurgical ---- do | 1,226 | 1,249 | NA |
| Breeze ---- do | 72 | 69 | NA |
| Total ---- do | 1,298 | 1,318 | 1,315 |
| Fuel briquets, all grades | 7,063 | -- | NA |
| Gas: | | | |
| Manufactured (city gas only) ---- million cubic feet | 6,697 | 5,942 | NA |
| Natural, gross production ---- do | 43,861 | 46,933 | 51,100 |
| Natural gas liquids and liquefied petroleum gas: [4] | | | |
| Propane and butane ---- thousand 42-gallon barrels | 2,278 | 524 | NA |
| Natural gasoline and pentane ---- do | [r] 265 | 228 | NA |
| Petroleum: | | | |
| Crude oil: | | | |
| As reported ---- thousand tons | 3,200 | 3,332 | 3,458 |
| Converted ---- thousand 42-gallon barrels | 23,702 | 24,680 | 25,610 |
| Refinery products: [5] | | | |
| Gasoline ---- do | 11,849 | 12,988 | 13,830 |
| Jet fuel ---- do | 1,617 | 1,913 | 2,520 |
| Kerosine ---- do | 73 | 93 | |
| Distillate fuel oil ---- do | 18,613 | 19,083 | 20,328 |
| Residual fuel oil ---- do | 19,907 | 23,177 | 28,751 |
| Lubricants ---- do | 856 | 865 | 1,061 |
| Asphalt and bitumen ---- do | [r] 2,230 | 1,976 | 2,113 |
| Other ---- do | [r] 495 | 1,144 | NA |
| Refinery fuel and losses ---- do | [r] 2,220 | 2,443 | [e] 2,737 |
| Total ---- do | [r] 57,860 | 63,682 | 71,340 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, germanium, bentonite, kaolin, common clay, and diatomite are also produced but available information is inadequate to make reliable estimates of production levels.

[2] Figure reported as gross weight is apparently derived from converting various grades of fertilizer with different $P_2O_5$ or N contents to a standard equivalent figure. Nitrogen fertilizers were converted to a gross weight figure containing 20% nitrogen and phosphate fertilizers to a gross weight figure containing 16.5% $P_2O_5$.

[3] Includes vacuum salt.

[4] Includes natural gas liquids derived from gasfields, oilfields, and liquefied petroleum gas from refineries.

[5] Liquefied petroleum gas produced from refineries is included in both natural gas liquids and refinery fuels and losses. The manner in which data is presented in available sources makes this double counting unavoidable.

## TRADE

During 1973, the latest year for which data are available, Yugoslavia's mineral trade was diversified, and many commodities were exported to and imported from a large number of countries. Exports consisted mostly of nonferrous metals and products, and European countries were again the principal purchasers. Principal import items were bituminous coal, crude oil, and iron and steel semimanufactured products. The largest sources of mineral imports remained the U.S.S.R. and other COMECON [2] countries.

[2] COMECON (CMEA—Council for Mutual Economic Assistance) comprising the following countries: Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the U.S.S.R.

## Table 2.—Yugoslavia: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate thousand tons | 1,813 | 1,707 | U.S.S.R. 705; West Germany 413; Italy 234. |
| Alumina | 23,328 | 86,622 | Poland 36,201; Italy 22,571; Romania 10,721. |
| Metal, including alloys: | | | |
| Scrap | 6,534 | 5,559 | Italy 3,939; West Germany 1,528; France 92. |
| Unwrought | 30,759 | 42,216 | Japan 11,417; Poland 5,988; People's Republic of China 4,000. |
| Semimanufactures | r 36,393 | 40,953 | Czechoslovakia 9,914; Bulgaria 4,858; United States 4,801. |
| Antimony regulus | 1,315 | 1,114 | Mainly to U.S.S.R. |
| Bismuth, including alloys, all forms | 79 | 5 | All to United Kingdom. |
| Cadmium, including alloys, all forms | 171 | 78 | United Kingdom 36; Netherlands 33; Italy 5. |
| Chromium: | | | |
| Chromite | 7,583 | 3,060 | All to Czechoslovakia. |
| Oxide and hydroxide | 120 | 183 | West Germany 130; Switzerland 50; United States 3. |
| Cobalt, including metal, all forms | 6 | -- | |
| Copper: | | | |
| Matte | -- | 7 | All to Lebanon. |
| Copper sulfate | 4,609 | 6,038 | Italy 3,164; Romania 866; Greece 750. |
| Metal, including alloys: | | | |
| Scrap | 645 | 471 | All to Italy. |
| Unwrought | r 90,339 | 78,101 | United States 41,541; United Kingdom 13,169; France 9,450. |
| Semimanufactures | r 45,246 | 38,732 | Italy 5,340; United States 4,974; Czechoslovakia 4,654. |
| Iron and steel: | | | |
| Ore and concentrate | -- | 150 | All to Italy. |
| Roasted pyrite | 1,783 | 1,846 | All to Austria. |
| Metal: | | | |
| Scrap | 17,699 | 21,624 | Italy 16,768; West Germany 4,223; Austria 389. |
| Pig iron, ferroalloys, and similar materials | r 176,553 | 404,698 | People's Republic of China 159,409; Italy 85,425; Austria 52,397. |
| Steel, primary forms | r 4,503 | 48,189 | Switzerland 30,036; Hungary 9,637; France 4,990. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | r 116,763 | 260,481 | Turkey 56,305; U.S.S.R. 41,382; West Germany 24,814. |
| Universals, plates, and sheets | r 65,385 | 135,762 | U.S.S.R. 53,792; Italy 34,058; West Germany 17,093. |
| Hoop and strip | r 9,098 | 21,050 | Italy 18,587; Switzerland 1,291; Romania 1,151. |
| Rails and accessories | 46,684 | 60,988 | Romania 38,354; Poland 14,266; Bulgaria 6,641. |
| Wire | 387 | 6,814 | Italy 3,457; Israel 1,312; U.S.S.R. 731. |
| Tubes, pipes, and fittings | 87,113 | 127,458 | East Germany 77,299; Italy 32,948; West Germany 12,066. |
| Castings and forgings | 12,934 | 17,836 | Poland 6,383; Czechoslovakia 3,975; East Germany 2,091. |
| Lead: | | | |
| Ore and concentrate | 21,890 | 18,220 | West Germany 7,480; U.S.S.R. 6,236; Italy 4,504. |
| Oxides | 574 | 685 | Mainly to Italy. |
| Metal, including alloys: | | | |
| Unwrought | r 39,803 | 40,481 | U.S.S.R. 21,380; Austria 6,154; Czechoslovakia 6,116. |
| Semimanufactures | r 1,155 | 1,265 | France 539; Italy 515; Libya 65. |
| Magnesium metal, including alloys, all forms | 9 | -- | |
| Manganese: | | | |
| Ore and concentrate | -- | 380 | All to Italy. |
| Oxides | -- | 50 | All to Hungary. |
| Mercury 76-pound flasks | 13,678 | 13,551 | United States 9,917; Bulgaria 600; Hungary 600. |
| Nickel, including alloys, all forms | r 143 | 338 | West Germany 203; Italy 73; Switzerland 27. |

See footnote at end of table.

## Table 2.—Yugoslavia: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Platinum-group metals, including alloys, all forms, palladium -- troy ounces -- | r 1,222 | -- | |
| Selenium, elemental ------ kilograms -- | 40,890 | 40,784 | Mainly to United Kingdom. |
| Silicon ---------- | 13,892 | 18,005 | West Germany 4,748; Japan 4,488; United States 3,279. |
| Silver: | | | |
| Waste and sweepings troy ounces -- | 32,569 | -- | |
| Metal, including alloys, all forms thousand troy ounces -- | r 2,737 | 2,962 | West Germany 1,467; United Kingdom 1,070; Czechoslovakia 412. |
| Tin, including alloys, all forms long tons -- | r 125 | 124 | France 78; Austria 22; Italy 15. |
| Titanium: | | | |
| Oxides ---------- | -- | 1,674 | Mainly to East Germany. |
| Metal, including alloys, all forms -- | 85 | -- | |
| Uranium ore and concentrate ---------- | 791 | -- | |
| Zinc: | | | |
| Ore and concentrate ---------- | 49,735 | 50,852 | Mainly to Bulgaria. |
| Oxide ---------- | 1,516 | 1,190 | Italy 340; East Germany 300; Hungary 250. |
| Metal, including alloys: | | | |
| Blue powder ---------- | 1,873 | 2,141 | Mainly to Czechoslovakia. |
| Unwrought ---------- | 22,288 | 34,559 | Czechoslovakia 11,552; United States 10,135; Italy 4,874. |
| Semimanufactures ---------- | 10,182 | 9,736 | West Germany 3,956; Czechoslovakia 2,966; France 620. |
| Other: | | | |
| Ash and residue containing nonferrous metals ---------- | 8,411 | 6,414 | Mainly to Italy. |
| Oxides, hydroxides, and peroxides of metals, n.e.s ---------- | 66 | 54 | Mainly to West Germany. |
| Metals, including alloys, all forms, metalloids ---------- | 85 | -- | |
| NONMETALS | | | |
| Abrasives, natural, n.e.s., grinding and polishing wheels and stones ---------- | r 1,379 | 2,528 | Poland 1,178; Romania 644; U.S.S.R. 198. |
| Asbestos ---------- | 974 | 747 | Albania 543; West Germany 142; Czechoslovakia 62. |
| Barite and witherite ---------- | 51,816 | 38,368 | U.S.S.R. 28,130; Hungary 9,618; Albania 600. |
| Cement ---------- | 20,886 | 88,703 | Libya 68,756; Italy 6,875; Israel 4,600. |
| Chalk ---------- | 23 | 51 | Mainly to Lebanon. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite ---------- | 18,056 | 15,881 | Poland 10,619; East Germany 3,886; Hungary 797. |
| Fire clay ---------- | r 26,605 | 14,129 | Italy 7,409; Hungary 6,386; Greece 300. |
| Kaolin ---------- | r 354 | 73 | Mainly to Italy. |
| Other ---------- | r 7,024 | 11,801 | Do. |
| Products: | | | |
| Refractory (including nonclay bricks) ---------- | r 74,932 | 77,696 | Poland 24,322; West Germany 17,759; Romania 16,608. |
| Nonrefractory ---------- | r 305 | 4,106 | Poland 2,271; Hungary 1,455; Italy 75. |
| Diatomite and other infusorial earth --- | -- | 41 | Mainly to Greece. |
| Feldspar ---------- | 13,166 | 18,223 | Hungary 6,614; Czechoslovakia 5,394; East Germany 3,301. |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous ---------- | r 48,591 | 42,857 | All to West Germany. |
| Phosphatic ---------- | r 177,490 | 286,107 | Hungary 126,098; Bulgaria 80,481; U.S.S.R. 78,879. |
| Other, including mixed ---------- | 241,027 | 254,396 | Hungary 118,449; Italy 39,266; West Germany 34,634. |
| Gypsum and plasters ---------- | 180 | 61 | Mainly to Hungary. |
| Lime ---------- | -- | 13,934 | Do. |
| Magnesite ---------- | 19,956 | 37,147 | Poland 18,186; United States 7,260; Italy 7,226. |
| Pyrite (gross weight) ---------- | 22,534 | 22,391 | Czechoslovakia 10,998; West Germany 5,999; Italy 5,394. |
| Salt and brine ---------- | 610 | 51 | Mainly to Hungary. |

See footnote at end of table.

## Table 2.—Yugoslavia: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Sodium and potassium compounds, n.e.s | r 5,884 | 15,434 | Italy 8,859; Brazil 5,100; Albania 1,000. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | r 77,991 | 54,364 | Italy 37,239; West Germany 5,594; Czechoslovakia 3,453. |
| Worked | 6,464 | 6,809 | Austria 4,834; West Germany 1,668; Czechoslovakia 130. |
| Dolomite, chiefly refractory grade | 393 | -- | |
| Gravel and crushed rock | r 3,240 | 4,344 | Italy 1,579; West Germany 686; Greece 509. |
| Limestone (except dimension) | 274 | 348 | Mainly to Hungary. |
| Quartz and quartzite | r 18,914 | 15,582 | Mainly to West Germany. |
| Sand, excluding metal bearing | r 649 | 238 | All to Libya. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 1,391 | 4,745 | Mainly to Romania. |
| Colloidal | 20 | -- | |
| Sulfur dioxide | -- | 63 | Mainly to Hungary. |
| Sulfuric acid | r 18,837 | 1,517 | Romania 802; Austria 715. |
| Talc, steatite, soapstone, and pyrophyllite | -- | 617 | Mainly to Poland. |
| Other: | | | |
| Crude: | | | |
| Calcite | 133 | 60 | Mainly to Libya. |
| Unspecified | -- | 10 | All to Italy. |
| Slag, dross and similar waste, not metal bearing | 4,419 | 2,807 | Italy 1,917; Austria 889. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | 175 | 181 | Mainly to Poland. |
| Coal and briquets: | | | |
| Anthracite and bituminous coal | 903 | 1,156 | All to Austria. |
| Lignite and lignite briquets | 589,863 | 517,914 | Mainly to Austria. |
| Hydrogen, helium, and rare gases kilograms | -- | 452 | All to Pakistan. |
| Peat, including peat briquets and litter | r 31 | -- | |
| Petroleum: | | | |
| Crude and partly refined: | | | |
| Crude thousand 42-gallon barrels | 559 | 528 | Mainly to Austria. |
| Partly refined do | 218 | 144 | All to Austria. |
| Refinery products: | | | |
| Gasoline do | 132 | 265 | Mainly to Czechoslovakia. |
| Kerosine and jet fuel do | 108 | 142 | United Kingdom 75; France 10; Netherlands 9. |
| Distillate fuel oil do | r 207 | 204 | Austria 25; Greece 23; Panama 20. |
| Residual fuel oil do | 387 | 406 | Greece 103; Israel 100; Liberia 41. |
| Lubricants do | r 48 | 7 | Austria 3; Czechoslovakia 2; Bulgaria 1. |
| Other: | | | |
| Liquefied petroleum gas do | 261 | 178 | Mainly to Italy. |
| White spirit do | 8 | 14 | All to Austria. |
| Mineral jelly and wax do | 23 | 41 | Italy 24; West Germany 16. |
| Petroleum coke do | 55 | 43 | Mainly to West Germany. |
| Unspecified do | 461 | 403 | Austria 180; United Kingdom 51; Romania 45. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | r 2,361 | 3,776 | Mainly to Italy. |

r Revised.

## Table 3.—Yugoslavia: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite and concentrate thousand tons | 166 | 170 | Mainly from Australia. |
| Oxide and hydroxide | r 46,810 | 46,220 | Mainly from Guinea. |
| Metal, including alloys: | | | |
| Unwrought | 45,872 | 56,664 | U.S.S.R. 35,046; Bulgaria 3,981; Austria 3,767. |
| Semimanufactures | r 13,228 | 20,036 | U.S.S.R. 5,632; West Germany 5,268; Italy 2,533. |
| Antimony: | | | |
| Ore and concentrate | 1,383 | 1,677 | All from Turkey. |
| Metal, including alloys, all forms | 191 | 71 | Austria 25; Italy 20; United Kingdom 15. |
| Arsenic: | | | |
| Trioxide, pentoxide and acids | r 18 | 68 | Mainly from West Germany. |
| Metal, including alloys, all forms | 15 | 4 | All from West Germany. |
| Beryllium, including alloys, all forms kilograms | 38 | 75 | Mainly from West Germany. |
| Bismuth, including alloys, all forms | 22 | 8 | Netherlands 3; Switzerland 2; Japan 2. |
| Cadmium, including alloys, all forms | (1) | 21 | U.S.S.R. 10; Netherlands 6; United Kingdom 4. |
| Chromium: | | | |
| Chromite | 58,660 | 161,399 | Albania 114,911; U.S.S.R. 34,986; Turkey 9,551. |
| Oxide and hydroxide | 772 | 417 | Mainly from U.S.S.R. |
| Metal, including alloys, all forms | 1 | 35 | United Kingdom 14; Albania 14; Switzerland 5. |
| Cobalt: | | | |
| Oxide and hydroxide | 102 | 19 | Mainly from Belgium-Luxembourg and West Germany. |
| Metal, including alloys, all forms | 37 | 46 | Belgium-Luxembourg 31; Switzerland 6; United Kingdom 5. |
| Columbium and tantalum, tantalum, including alloys, all forms kilograms | 124 | 215 | United States 110; Austria 60; Hungary 30. |
| Copper: | | | |
| Ore and concentrate | 61,911 | 34,957 | Mainly from Chile. |
| Copper sulfate | 296 | 20 | All from Bulgaria. |
| Metal, including alloys: | | | |
| Scrap | 2 | (1) | All from Austria. |
| Unwrought | 34,117 | 59,357 | United Kingdom 22,322; Chile 20,144; Zambia 12,679. |
| Semimanufactures | 17,595 | 13,328 | Chile 3,754; U.S.S.R. 3,037; West Germany 2,128. |
| Germanium, including alloys, all forms kilograms | 1 | 52 | Mainly from Poland. |
| Iron and steel: | | | |
| Ore and concentrate | 282,709 | 389,870 | Brazil 248,647; U.S.S.R. 75,319; Mauritania 36,267. |
| Metal: | | | |
| Scrap | r 261,708 | 298,636 | U.S.S.R. 145,302; Poland 81,375; West Germany 28,122. |
| Pig iron, including cast iron | r 95,986 | 34,507 | U.S.S.R. 17,940; Canada 6,977; Czechoslovakia 6,730. |
| Sponge iron, powder and shot | 1,826 | 2,094 | Sweden 1,496; France 339; Italy 187. |
| Ferroalloys: | | | |
| Ferromanganese | r 1,541 | 3,619 | Italy 1,686; United Kingdom 768; West Germany 585. |
| Other | r 3,522 | 3,674 | West Germany 1,865; France 660; Austria 436. |
| Steel, primary forms: | | | |
| Blooms, billets, slabs, sheet bars | r 165,115 | 168,810 | U.S.S.R. 98,494; Czechoslovakia 39,610; East Germany 17,679. |
| Coils for recoiling | 158,376 | 208,579 | U.S.S.R. 122,810; Czechoslovakia 52,163; Bulgaria 12,054. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | r 366,176 | 239,889 | Romania 66,177; U.S.S.R. 34,840; Bulgaria 22,894. |
| Universals, plates, and sheets | r 462,729 | 594,135 | Japan 150,167; Czechoslovakia 81,006; West Germany 73,103. |
| Hoop and strip | 79,596 | 106,918 | West Germany 23,041; U.S.S.R. 21,759; Czechoslovakia 11,300. |
| Rails and accessories | 1,993 | 3,374 | West Germany 1,769; Austria 958; U.S.S.R. 358. |

See footnotes at end of table.

## Table 3.—Yugoslavia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Metal—Continued | | | |
| Semimanufactures—Continued | | | |
| Wire | r 24,547 | 39,761 | West Germany 15,066; Romania 12,270; Italy 4,445. |
| Tubes, pipes and fittings | r 82,395 | 65,971 | East Germany 17,725; Bulgaria 12,263; West Germany 11,961. |
| Castings and forgings, rough | 1,297 | 678 | West Germany 361; Austria 124; Italy 112. |
| Lead: | | | |
| Ore and concentrate | 3,048 | 3,768 | Mainly from Morocco. |
| Oxides | r 623 | 198 | West Germany 106; Austria 80; U.S.S.R. 11. |
| Metal, including alloys: | | | |
| Scrap | -- | 1,173 | Austria 709; Switzerland 317; United Kingdom 122. |
| Unwrought | r 5,806 | 13,736 | Bulgaria 6,792; Zambia 2,152; Italy 1,524. |
| Semimanufactures | 36 | 11 | All from West Germany. |
| Magnesium metal, including alloys, all forms | 581 | 1,275 | United States 420; West Germany 268; U.S.S.R. 175. |
| Manganese: | | | |
| Ore and concentrate | 58,699 | 56,688 | Gabon 19,092; Brazil 16,383; U.S.S.R. 14,345. |
| Oxides | 2,538 | 1,817 | Gabon 938; Belgium-Luxembourg 355; Japan 345. |
| Metal | 103 | 157 | United States 59; Netherlands 41; Switzerland 25. |
| Mercury ---- 76-pound flasks | 701 | 20 | All from United Kingdom. |
| Molybdenum: | | | |
| Ore and concentrate - kilograms | 40 | -- | |
| Metal, including alloys, all forms | 130 | 16 | Mainly from Austria. |
| Nickel metal, including alloys, all forms: | | | |
| Scrap | -- | 11 | All from Netherlands. |
| Matte, speiss, and similar materials | -- | 20 | Mainly from Austria. |
| Unwrought | 507 | 1,366 | France 294; Netherlands 263; Austria 255. |
| Semimanufactures | r 611 | 1,428 | West Germany 649; Austria 538; Italy 91. |
| Platinum-group metals, including alloys, all forms: | | | |
| Platinum ---- troy ounces | r 2,596 | 1,304 | U.S.S.R. 804; Italy 217; West Germany 209. |
| Palladium ---- do | r 46,422 | 26,007 | Mainly from U.S.S.R. |
| Rhodium ---- do | r 354 | -- | |
| Other ---- do | 418 | 841 | Sweden 518; United Kingdom 321; West Germany 2. |
| Selenium, elemental ---- kilograms | 450 | -- | |
| Silver metal, including alloys thousand troy ounces | r 1,138 | 1,890 | Switzerland 718; West Germany 539; United Kingdom 259. |
| Tellurium, elemental ---- kilograms | 495 | -- | |
| Tin: | | | |
| Oxides ---- long tons | r 24 | 15 | Mainly from West Germany. |
| Metal, including alloys: | | | |
| Unwrought ---- do | r 716 | 1,335 | Mainly from Malaysia. |
| Semimanufactures ---- do | r 112 | 62 | Mainly from West Germany. |
| Titanium: | | | |
| Ore and concentrate | 2,637 | 24,031 | Mainly from Australia. |
| Oxides | 5,308 | 5,515 | West Germany 2,325; France 1,547; Czechoslovakia 475. |
| Metal, including alloys, all forms | 2 | 4 | Mainly from United Kingdom. |
| Tungsten metal, including alloys, all forms | 59 | 56 | Netherlands 25; United Kingdom 19; France 5. |
| Zinc: | | | |
| Ore and concentrate | 6,250 | 44,702 | Canada 28,371; Mexico 6,380; West Germany 5,006. |
| Oxide | r 176 | 138 | Mainly from West Germany. |
| Metal, including alloys: | | | |
| Blue powder | 2 | -- | |
| Unwrought | r 23,845 | 27,995 | Zambia 19,598; Bulgaria 4,843; West Germany 2,326. |
| Semimanufactures | r 688 | 1,189 | West Germany 947; Italy 101; Japan 84. |

See footnotes at end of table.

## Table 3.—Yugoslavia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Zirconium including alloys, all forms | 6 | 20 | Switzerland 10; Italy 9; West Germany 1. |
| Other: | | | |
| Ore and concentrate: | | | |
| Of vanadium, tantalum and zirconium | 887 | 1,497 | Mainly from Australia. |
| Of base metals, n.e.s | -- | 50 | All from Turkey. |
| Ash and residue containing nonferrous metals | 309 | 446 | Mainly from Austria. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | r 661 | 641 | West Germany 459; Norway 59; Netherlands 48. |
| Metals, including alloys, all forms: | | | |
| Metalloids | 2 | 26 | East Germany 15; West Germany 10. |
| Akali, alkaline earth, and rare-earth metals | 193 | 173 | France 89; West Germany 60; Italy 20. |
| Pyrophoric alloys | 8 | 8 | Mainly from People's Republic of China. |
| Base metals, including alloys, all forms, n.e.s | 39 | 25 | Mainly from United Kingdom. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 1,061 | 1,011 | Italy 401; Greece 238; Denmark 228. |
| Grinding and polishing wheels and stones | r 1,236 | 1,371 | Austria 910; Italy 183; West Germany 168. |
| Asbestos | 43,282 | 39,038 | U.S.S.R. 25,073; Botswana 7,707; Canada 5,947. |
| Barite and witherite | r 617 | 1,362 | Greece 500; West Germany 317; Italy 224. |
| Boron materials: | | | |
| Crude natural borates | 11,832 | 14,639 | Mainly from United States. |
| Oxide and acid | r 372 | 1,252 | U.S.S.R. 475; France 250; Czechoslovakia 200. |
| Bromine | 3 | 9 | Mainly from Austria and United Kingdom. |
| Cement: | | | |
| Portland thousand tons | 590 | 605 | U.S.S.R. 280; Romania 161; Italy 64. |
| Other do | 302 | 264 | Mainly from Italy. |
| Chalk | 1,083 | 966 | Mainly from France. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | 33 | 334 | Mainly from Greece. |
| Fire clay | r 10,650 | 15,017 | Mainly from Czechoslovakia. |
| Fuller's earth, dinas, chamotte | r 3,429 | 2,746 | West Germany 1,513; Austria 697; Czechoslovakia 363. |
| Kaolin | 38,330 | 48,768 | Czechoslovakia 21,438; East Germany 11,717; Greece 9,734. |
| Other | r 3,402 | 5,557 | Bulgaria 3,066; Czechoslovakia 1,469; West Germany 562. |
| Products: | | | |
| Refractory (including nonclay bricks) | r 17,974 | 24,213 | West Germany 8,632; Austria 5,060; Italy 3,357. |
| Nonrefractory | r 237,587 | 223,234 | Romania 88,151; Bulgaria 43,187; Italy 36,061. |
| Cryolite and chiolite | (1) | 750 | All from West Germany. |
| Diamond: | | | |
| Gem, not set or strung carats | 5,370 | 9,150 | Belgium-Luxembourg 6,350; Switzerland 1,000; People's Republic of China 900. |
| Industrial do | 101,150 | 225,585 | Switzerland 119,600; United Kingdom 52,220; Austria 37,300. |
| Powder do | 121,285 | 125,850 | U.S.S.R. 71,975; Netherlands 27,400; United Kingdom 13,750. |
| Diatomite and other infusorial earth | r 2,586 | 691 | Czechoslovakia 266; Austria 168; East Germany 90. |
| Feldspar | 51 | 20 | All from West Germany. |
| Fertilizer materials: | | | |
| Crude, phosphatic thousand tons | 1,062 | 1,025 | Mainly from Morocco. |
| Manufactured: | | | |
| Nitrogenous | 151,121 | 190,871 | U.S.S.R. 151,859; Poland 17,130; Bulgaria 16,191. |
| Phosphatic | 38,989 | 25,504 | All from Morocco. |
| Potassic | 375,270 | 331,222 | U.S.S.R. 168,080; East Germany 154,013; West Germany 9,000. |

See footnotes at end of table.

## Table 3.—Yugoslavia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials—Continued | | | |
| Manufactured—Continued | | | |
| Other, including mixed | 10 | 26,093 | Poland 16,584; Spain 5,000; Mexico 4,500. |
| Ammonia | r 28,375 | 40,166 | Hungary 23,238; Austria 7,221; Czechoslovakia 4,564. |
| Fluorspar | 4,948 | 4,449 | East Germany 3,110; Austria 897; West Germany 262. |
| Graphite, natural | 2,045 | 1,934 | Austria 1,345; U.S.S.R. 301; West Germany 115. |
| Gypsum and plasters | r 559 | 108 | Mainly from Italy. |
| Iodine | 8 | 22 | West Germany 10; Austria 5; United Kingdom 4. |
| Lime | r 13,237 | 8,251 | Bulgaria 4,568; Austria 2,625; Italy 1,058. |
| Magnesite | 585 | 6,116 | Italy 3,083; Turkey 2,366; West Germany 344. |
| Mica: | | | |
| Crude, including splittings and waste | r 191 | 187 | Norway 102; West Germany 63; Austria 16. |
| Worked, including agglomerated splittings | r 78 | 109 | Switzerland 29; France 23; Czechoslovakia 19. |
| Pigments, mineral: | | | |
| Natural, crude | 6 | 86 | West Germany 33; Netherlands 28; Hungary 25. |
| Iron oxides, processed | 1,844 | 2,165 | West Germany 1,425; Czechoslovakia 250; France 151. |
| Precious and semiprecious stone, except diamond: | | | |
| Natural ---- kilograms | r 102 | 82 | Switzerland 18; West Germany 17; Austria 15. |
| Manufactured ---- do | 227 | 207 | Switzerland 108; Czechoslovakia 38; Austria 25. |
| Pyrite (gross weight) | r 108,564 | 210,942 | Mainly from U.S.S.R. |
| Quartz, piezoelectric ---- kilograms | 1,062 | 1,741 | United States 925; United Kingdom 808; Japan 7. |
| Salt and brine | 71,610 | 114,279 | Romania 73,266; Tunisia 40,410; West Germany 358. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | r 70,774 | 87,373 | Italy 44,131; West Germany 27,749; France 15,299. |
| Caustic potash, sodic and potassic peroxides | r 2,488 | 1,189 | East Germany 652; Czechoslovakia 316; Italy 146. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous | 623 | 3,896 | Mainly from Italy. |
| Slate | 393 | 520 | Mainly from West Germany. |
| Other | 683 | 2,679 | Mainly from Italy. |
| Worked: | | | |
| Slate | 61 | 191 | Do. |
| Other | 1,877 | 178 | Do. |
| Dolomite, chiefly refractory grade | r 5,998 | 5,723 | Do. |
| Gravel and crushed rock | r 99,742 | 72,630 | Hungary 54,693; Austria 17,337; West Germany 293. |
| Limestone (except dimension) | 11,513 | 16,680 | All from Hungary. |
| Quartz and quartzite | 11,158 | 7,031 | West Germany 4,305; Greece 2,500; Switzerland 126. |
| Sand, excluding metal bearing | 69,571 | 81,501 | Italy 41,948; Hungary 23,803; West Germany 8,712. |
| Sulfur: | | | |
| Elemental, all forms | r 33,187 | 42,420 | Poland 36,166; West Germany 4,209; Italy 2,004. |
| Sulfur dioxide | -- | 63 | All from Hungary. |
| Sulfuric acid | 9,649 | 61,125 | Hungary 44,490; Bulgaria 15,625; West Germany 1,008. |
| Talc, steatite, soapstone, and pyrophyllite | 1,610 | 2,040 | Italy 976; Austria 199; West Germany 112. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 4,885 | 23,451 | Greece 15,500; Hungary 6,624; Austria 1,277. |
| Slag, dross, and similar waste, not metal bearing | r 173,339 | 172,132 | Mainly from Italy. |
| Oxides and hydroxides of magnesium, strontium, and barium | 310 | 325 | West Germany 170; United States 83; France 31. |

See footnotes at end of table.

Table 3.—Yugoslavia: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | r 6,680 | 1,453 | Mainly from Albania. |
| Carbon black and gas carbon | 4,531 | 9,609 | Italy 6,662; West Germany 2,476; East Germany 155. |
| Coal and briquets: | | | |
| Anthracite and bituminous coal thousand tons | r 1,885 | 1,964 | U.S.S.R. 1,162; Czechoslovakia 625; United States 141. |
| Briquets of anthracite and bituminous coal | -- | 200 | All from Netherlands. |
| Lignite and lignite briquets | r 277 | 17,869 | All from Hungary. |
| Coke and semicoke -- thousand tons | 302 | 482 | Poland 216; U.S.S.R. 108; Czechoslovakia 61. |
| Hydrogen, helium, and rare gases kilograms | r 6,495 | 2,355 | Italy 1,064; West Germany 554; Austria 300. |
| Peat, including peat briquets and litter | 3,879 | 4,636 | Poland 2,832; Hungary 1,286; Austria 400. |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | 31,034 | 61,206 | Iran 34,542; U.S.S.R. 16,902; Iraq 7,375. |
| Partly refined do | 192 | 127 | Italy 50; Czechoslovakia 27; West Germany 23. |
| Refinery products: | | | |
| Gasoline do | 146 | 285 | Algeria 102; U.S.S.R. 96; Netherlands 29. |
| Kerosine and jet fuel do | 57 | 45 | U.S.S.R. 30; Switzerland 13; Italy 1. |
| Distillate fuel oil do | r 3,121 | 2,751 | U.S.S.R. 1,943; Romania 727; Algeria 76. |
| Residual fuel oil do | 3,195 | 4,332 | Mainly from U.S.S.R. |
| Lubricants do | r 344 | 285 | Hungary 40; United Kingdom 39; Netherlands 32. |
| Other: | | | |
| Liquefied petroleum gas do | (1) | 131 | Bulgaria 78; Italy 18; Hungary 16. |
| Mineral jelly and wax do | r 37 | 35 | East Germany 10; Romania 8; Hungary 7. |
| Nonlubricating oils, n.e.s. do | 33 | 48 | U.S.S.R. 25; Austria 17; Netherlands 3. |
| Bitumen and other residues do | 379 | 630 | Albania 318; Italy 168; Czechoslovakia 119. |
| Bituminous mixtures, n.e.s. do | 35 | 28 | Italy 18; West Germany 8; United Kingdom 1. |
| Pitch do | 18 | 29 | Mainly from Italy. |
| Petroleum and pitch coke do | 197 | 240 | United States 128; Italy 107; Syria 4. |
| Unspecified do | 223 | 171 | Italy 104; Switzerland 41; Bulgaria 12. |
| Total do | r 7,785 | 9,010 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | r 48,912 | 35,622 | Bulgaria 11,749; Italy 8,084; Hungary 4,009. |

r Revised.
1 Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Aluminum.**—Programs continued on converting the country's aluminum industry from a producer and exporter of bauxite to a processor of bauxite and exporter of aluminum metal. New aluminum-producing facilities were under construction or completed. To meet increased bauxite demand, new bauxite mines were prepared and old ones expanded. Although output of bauxite, alumina, and aluminum increased, demand for aluminum exceeded the available supply, and imports were necessary.

In anticipation of increased future domestic demand, expansion of bauxite-producing facilities was underway at yearend. Plans to increase annual bauxite production from 320,000 to 500,000 tons were made public at the Mostar bauxite mine. At the Nikšić bauxite mine, expansion continued, and output of 450,000 tons, achieved in 1974, was scheduled to reach

750,000 tons in 1976. The management of the Nikšić mine was also examining the possibility of increasing bauxite output to 1.5 million tons per year by 1980 or later. Output in the Sumarica open cast mine at the Vlasenica bauxite-producing area increased to 300,000 tons. Bačun, the new mining area, was ready for initial production of 300,000 tons of bauxite per year. This output will be increased to 600,000 tons. Development of the Podbracan underground mine should lead to production of 400,000 tons of bauxite per year. Most of the bauxite produced in the area will be used at the Vlasenica alumina plant, which was under construction during 1974.

Development continued at the Vlasenica project, a 600,000-ton-per-year alumina plant, near Zvornik, partly financed with a $130 million[3] loan from the U.S.S.R. Technicians from the U.S.S.R. designed the plant and Soviet factories started deliveries of equipment. Completion of the project was planned for 1976. For a 10-year period after completion, most of the alumina from the plant will be shipped to the U.S.S.R. for repayment of the loan. The alumina plant is located at Karakaj, a locality near Zvornik in Bosnia.[4]

Although construction of the Sibenik aluminum plant was completed and production started in 1973, the plant was operating much below its 75,000-ton-per-year capacity during 1974. Shortages of electric power prevented operation at full capacity. At yearend, the situation had improved and of a total of 208 electrolytic cells only 32 cells were out of production.

Construction of the 280,000-ton-per-year alumina plant at Mostar also continued. Production was planned for 1975. Total cost for the plant amounted to the equivalent of $30 million and was partly financed by loans from France. Construction of an 85,000-ton-per-year aluminum plant, also at Mostar, was underway at yearend. When completed in 1976 or early in 1977, Mostar will have an integrated installation from bauxite to aluminum metal. The state-owned firm Energoinvest from Sarajevo is the investor for the project and will manage both plants.

At the Titograd alumina and aluminum plant, construction started on a new aluminum rolling mill with an annual capacity of 15,000 tons of semimanufactured products. The Italian company, Temko, will provide the "know-how." The new plant will employ 450 workers. Production was scheduled for late in 1975 or early in 1976.

In Sevojno, Serbia, a 35,000-ton-per-year plant for production of aluminum-rolled semimanufactures went onstream in the spring of 1974. The new facility is part of an existing copper-rolling mill and will employ an additional 800 workers. Most of the production, about 80%, has been contracted for export. Aluminum from the Titograd aluminum plant and imported metal will be used in the new facility.

**Antimony.**—The inactive Lojane mine near Kumanovo, in Serbia, will be reopened. Rudarsko Topionički Bazen Zajača, the country's only mine and smelter producer of antimony, Jugometal of Belgrade, and Opalska Breča of Kumanovo, concluded an agreement to finance reopening of the Lojane mine at a cost equivalent to $690,000. Production will start early in 1975 with an annual output of 45,000 tons of ore and 2,300 tons of antimony concentrate. Concentrate will be processed at the Zajača smelter.

At Mramor, on Kapaonik Mountain, near Brus, Serbia, a new antimony mine will be opened. Capacity of the mine and flotation plant were not made public.

**Copper.**—Rudarsko Topioničarski Bazen, Bor (RTB), Serbia, with its mine, flotation plant, and smelter at Bor; mine and flotation plant at Majdanpek; and new mine under development at Krivelj, remained the principal activity related to copper. However, development continued at the Bučim copper deposit, near Radovište, in Macedonia. Bučim was expected to become the second copper-producing facility in Yugoslavia.

At RTB, plans were announced to increase annual copper production to 200,000 tons and subsequently to 240,000 tons.[5] The key to this development will be the opening of a large deposit of low-grade ore at Krivelj. The management of RTB expects Krivelj to reach its planned annual

[3] Where necessary values have been converted from Yugoslav dinars (din) to U.S. dollars at a rate of din17=US$1.00.

[4] During 1974, this plant was mentioned in different publications as Vlasenica, Zvornik, or Birac plant.

[5] U.S. Embassy, Belgrade, Yugoslavia. State Department Airgram A-250, May 15, 1975, 2 pp. and 3 attachments.

capacity of 60,000 tons of copper in 1981. Kaiser Engineering Co. has prepared basic studies on the equipment for mining and beneficiating Krivelj ore. In September, the directors of the Export-Import Bank authorized a $2,820,000 loan to RTB to finance approximately 30% of the cost of equipment for its copper mining operation. Repayments are to be made semiannually over a period of 7 years at an interest rate of 8% and a guarantee fee of 1%.

The old Bor beneficiation plant was modernized without interrupting production. Copper recovery improved 9% compared with the previous year and reached 82% to 85% of capacity.

A break in a dam on a water-storage lake stopped production at the Majdanpek flotation plant during January. The damage was repaired, and the plant was again in operation in February.

Exploration and preliminary work continued for development of the Bučim copper deposit. A mine and beneficiation plant were planned, and preliminary work had started at the deposit. When the first phase of development is completed in 1977, capacity will reach 21,000 tons of copper per year. This capacity will be expanded later to 60,000 tons of copper. At yearend financing had been arranged. The U.S. Export-Import Bank approved a direct $10 million credit to purchase U.S. technology and equipment for development. This credit will provide 45% of the total $22.5 million required for all equipment and services. The remaining financing will be covered by U.S. companies (45%) and by financial institutions of Macedonia (10%).

**Iron and Steel.**—Renovation and expansion continued in the iron and steel industry. Domestic output of iron and steel products was inadequate to meet demand, and imports of iron and steel semimanufactures were by value one of the largest import items. Shortages of electric power slowed production at ferroalloy and steel plants during the last part of the year.

In Zenica, Bosnia, the largest iron and steel plant in the country, the second phase of a renovation and expansion program was in progress. When completed in 1975, annual production of steel should reach 2.5 million tons. The tabulation below shows tentative annual output capacities for steel plants in 1985:

| | *Million tons* |
|---|---|
| Existing plants: | |
| Slovenia | 1.10 |
| Zenica | 2.65 |
| Skopje | 2.06 |
| Smederevo | 2.79 |
| Sisak | 1.60 |
| Nikšić | .40 |
| New plants: | |
| Prijedor | 3.00 |
| Jadranska Zelezara | 2.20 |
| Total | 15.80 |

**Lead and Zinc.**—Renovation of the Stari Trg and the Kopaonik mines, and development of mines at Zute Prline. Kopaonik, and Crnac, all in Serbia, and at Mojkovac-Brskovo in Montenegro continued during 1974. These activities were part of the Trepča Enterprise efforts to increase lead and zinc mine capacity in the country.

In the vicinity of the new Blagodat mine near Kriva Feja, Serbia, on Besna Kobila Mountain, discovery of a new lead and zinc deposit was announced.

In Macedonia, two new lead and zinc mines were planned in 1974. These mines, located in Makedonska Kamenica and Kriva Palanka, will have an aggregate annual capacity of 1.5 million tons of ore. The smelter at Titov Veles will process concentrates from these two mines.

In Bosnia, east of Ljubovia, a deposit containing about 2 million tons of polymetallic ore was discovered. However, the location of the deposit, which would require building a road in difficult terrain, makes development in the near future questionable.

**Nickel.**—At Rzanovo, near Kavadarci, preliminary work continued on a nickel project, managed by Feni. The U.S. Export-Import Bank extended a $38.7 million credit to support an $86 million sale of U.S. goods and services. Arthur G. McKee Co., of Cleveland, Ohio, will furnish technical assistance for the project. Plans call for mine development, a 64,000-ton-per-year ferronickel plant, and auxiliary installations. Initial production was scheduled for 1979. According to reports, about 24 million tons of nickel-bearing ore, with an average nickel content of 0.9%, was discovered and confirmed in the area.

Based on two nickel deposits, Goleš and Cikatovo, in Kosovo, Serbia, plans were made for development of mines and a smelter in the area. Approximately 1.2

million tons of ore will be produced yearly. The new smelter was planned for an annual production of 10,500 tons of ferronickel. Preliminary figures set ore reserves in the area at 25 million tons. Specialists from the U.S.S.R. were working on the project, and Soviet equipment will be purchased for the mine, beneficiation plant, and smelter. At yearend financing was not assured.

**Uranium.**—The cornerstone was laid and construction started on Yugoslavia's first nuclear power station near Krško. The 615-megawatt nuclear powerplant (pressurized water reactor) will be built by Westinghouse Electric Corp. To fuel the reactor, domestic uranium concentrate (yellowcake—$U_3O_8$) will be enriched in the United States. To provide necessary ore and concentrate, development of domestic uranium deposits continued. The focal point remained the uranium deposit at Zirovski Vrh in Slovenia. In addition to several hundred drill holes that covered an area of 120 square kilometers, approximately 5 kilometers of drift were driven through the deposit. According to plans, the mine will supply ore for a 300-ton-per-year capacity concentrator to be built at the minesite. Reserves at Zirovski Vrh were considered adequate to support production at this rate for a period of 15 years.

**Other Metals.**—Yugoslavia also produced bismuth, cadmium, chromite, germanium, gold, manganese, mercury, selenium, and silver in 1974. Except for mercury, produced at Idria, Slovenia, output of the other metals was modest. Bismuth was a byproduct of the lead and zinc operation at Trepča, Serbia; and cadmium was a byproduct at Trepča and at the Zorka plant at Sabac, Serbia. The Bor complex in Serbia yielded gold, germanium, and selenium as byproducts of copper. Manganese was produced in Bosnia. Trepča was the main source of silver, a byproduct of lead and zinc processing.

## NONMETALS

**Asbestos.**—Renovation continued at the asbestos mine near Stragari, Serbia, operated by Stragari-Azbest. New "know-how" was purchased in Japan. When the renovation is completed in 1975, production should double and reach an estimated output of 5,000 tons per year of asbestos. Reserves totaled about 12 million tons of ore with an average asbestos content of 12%. Another 10 million tons of probable ore reserves were reported in the vicinity of the Stragari mine. Most of the production will be exported in the form of fiber, fines, and tiles.

**Cement.**—Cement remained the most significant nonmetal produced in the country. Croatia and Serbia were the principal cement-producing states, providing 39% and 27%, respectively of the country's total output. Expansion of existing cement plants and the planning and construction of new facilities were aimed at ending shortages of cement. However, when all planned facilities are completed in 1985, Yugoslavia would have an annual cement capacity of 17 million tons. Domestic demand for 1985 was planned at 14 million tons. Consequently, 3 million tons of plant capacity will be available for production of cement for export. Controversy existed regarding wisdom of such an extensive expansion of the cement industry.

Production started at the 340,000-ton-per-year cement plant at Lukavac, in Bosnia. A 550,000-ton-per-year plant at Kosjerić, in Serbia, and a 330,000-ton-per-year plant at Plevlja, Montenegro, were near completion at yearend. In addition, expansion and renovation of the Koromačno cement plant near Labin, Croatia, was completed during the year. Annual capacity was increased from 70,000 tons to 400,000 tons.

Expansion continued at the Beočin and Popovac cement plants, in Serbia, and the Dalmacija and Podsused plants, in Croatia. The Beočin plant will have an annual capacity of 2 million tons, Podsused about 550,000 tons, and the Dalmacija and Popovac plants will add capacity of 600,000 tons each per year, when expansions are completed.

Construction started on the Anhovo cement plant at Anhovo, Slovenia. Annual capacity of the plant was planned at 1 million tons with a completion date in 1976. The International Finance Corp., an arm of the World Bank, has granted a $10 million loan. The remaining funds will be provided by a domestic bank (Ljubljanska Banka). The Anhovo cement products factory will use most of the cement produced at Anhovo. The Ostruznica, Našice, and Bela Palanka plants were in different stages of planning.

**Lime.**—Construction started on a 10,000-ton-per-year hydrated lime plant located in Lički Lešće, Croatia. This new plant will be part of the existing lime facility operated by a local enterprise.

**Marble.**—Approximately 100,000 cubic meters of marble were discovered near Mrzen, a small locality in the general area of Kavadar. At yearend, local authorities were trying to arrange financing for a quarry with an annual production capacity of 5,000 cubic meters of marble.

## MINERAL FUELS

Yugoslavia remained dependent on imports of high-rank coals, coke, and crude oil. Coal was the principal source of energy in Yugoslavia during 1974. As a source of energy, the significance of domestic coal increased because of higher prices for imported crude oil. Development of new coal mines, modernization of existing mines, and construction of new coke plants, petroleum refineries, gas and oil pipelines, and electric powerplants, including one nuclear, were the principal events in the energy industry of the country.

**Coal.**—Most of Yugoslavia's coal production consisted of low-rank coals. Brown coal and lignite comprised the bulk (98.2%) of the coal output. Approximately 2.5 million tons of bituminous coal, coke, and related products were imported. The coal industry had a stable and growing demand throughout the year, due principally to high prices for imported crude oil. These high oil prices made Yugoslav authorities continue the trend, started last year, to revert to coal, the most abundant energy source in the country. Coal-related projects, delayed in the past, have been given greater attention, and financing for most of them was secured. New mines were opened, and plans were drafted for increased coal production in all parts of the country. For the first time in its history, Macedonia was included in plans for future coal production.

In Bosnia and Herzegovina (Bosna i Hercegovina), the State with the largest production of coal, a new mine was developed, new coal deposits were discovered, and plans were made public to increase output threefold by 1985.

The new opencast mine, Gracanica, with an annual capacity of 500,000 tons of brown coal, produced almost at capacity at yearend. Most of the overburden had been removed, and the principal conveyor belts had been assembled.

In central Bosnia, near Zenica and Kakanj, new deposits of brown coal were discovered. Proven reserves of 250 million tons and possible reserves of 520 million tons were reported.[6]

According to a recently published plan, the coal mines of Bosnia and Herzegovina should increase annual output from 12 million tons in 1974 to 36 million tons in 1985. About 72.4% of this coal will be delivered to utilities, industry will receive about 19%, and households and others will receive the rest. To reach the planned targets, productivity in underground coal mines must increase from 2.5 tons per man-shift to 4 to 6 tons per man-shift. Investments in new equipment and in mine reconstruction were also part of the plan. Financing for the new development was not secured at yearend.

Macedonia was planning to join the coal-producing States of Yugoslavia. About 200 million tons of lignite were discovered near the village of Suvodol, Pelagonia, Macedonia. Total reserves in the area were estimated at 1,300 million tons of lignite. Based on Pelagonia's coal reserves, plans for construction of two thermal powerplants of 210 megawatts electrical each were discussed by planning authorities in Macedonia.

In Crna Gora financing was secured for development of a new mine, Petnjak. The Petnjak brown coal deposit is located near Ivangrad, where reserves in the existing mine, Budimlje, were near depletion. The Petnjak mine was scheduled to start production late in 1976 with an initial annual output of 200,000 tons. In the second phase of construction, annual mine capacity should increase to 300,000 tons. Reserves are expected to last over 50 years at that rate of production. About 700 workers will be employed when the mine is in full operation. Engineering for the new mine will be provided by domestic enterprises, and Kopex, from Poland, will supply the equipment.

The Plevlja mine, in Crna Gora, was scheduled for expansion from a present annual output of about 400,000 to 3.5 million tons in 1982. When completed, two powerplants, with a capacity of 210 megawatts electrical each, and the cement plant

[6] Privredni Pregled (Belgrade, Yugoslavia). May 7, 1974, p. 3.

at Plevlje will be the principal consumers of the additional coal.

In Serbia, coal-related activities were concentrated in the large lignite basins at Kolubara and Kosovo. The management of the Kolubara Basin adopted a $176 million investment plan for a new opencast mine, Tamnava. The mine was expected to be completed between 1978 and 1980. Reports indicated an annual mine capacity of 18 to 20 million tons. The Obrenovac thermal electric plant will use most of the lignite produced at Tamnava. An association of utility companies from Croatia will finance part of the mine development in exchange for an assured supply of coal to generate about 1,400 to 1,960 gigawatt-hours per year of electricity.

In the Kosovo coal basin, plans were made to increase annual lignite output at the Kosovo combine from 6.5 million to 27 million tons in 1982. This output could be increased to 53 million tons of coal by 1990. In the western part of the basin, coal reserves could sustain an annual production of 13 million tons for 64 years.

Coke demand remained higher than domestic production, and imports were essential to assure continuous operation of the iron and steel industry. As in the past, imported coking coal comprised the bulk of the coal processed in coking plants during 1974. To reduce dependence on imported coke, construction continued on a fourth coke battery (700,000 tons of coke per year) at the Lukavac coke plant.

The management of the Sisak (Zeljezara Sisak) iron and steel works at Sisak, Croatia, awarded a contract for design and construction of a 850,000-ton-per-year coke plant to Dr. C. Otto & Comp. GmbH of the Federal Republic of Germany. The new coke plant will be located in Bakar, near Rijeka on the Adriatic Sea, and will consist of 65 double-flue, slot-type coke ovens with a daily coking coal throughput of 3,300 tons. Plant completion was planned for 1977 or early in 1978. Two-thirds of total cost of $50.5 million will be financed by the West German firm; Yugoslavia's banks will provide the balance. Design for the plant provided for future expansion of annual production to 1.7 million tons of coke. The steel plant at Sisak and steel plants in Slovenia will be the principal users of the coke from Bakar.

**Petroleum.**—Production of crude oil reached an alltime high of 3.5 million tons (about 70,000 barrels per day) in 1974. This increased output resulted from higher production at the Beničanci Field in Croatia and the Kikinda and Velebit Fields in Serbia. Industrija Nafte (INA), headquartered in Zagreb, Croatia, and Naftagas in Novi Sad (Vojvodina), Serbia, remained the only producers of, and the most important refiners of, crude oil in the country. INA was by far the largest, accounting for about 70% of the total output. Naftagas produced the rest.

Six refineries, three operated by INA, two by Naftagas, and one by Energoinvest, had an installed annual capacity of 13.2 million tons.

INA-Naftaplin ordered an offshore drilling rig (jack-up type) in the Netherlands. High prices for offshore drilling contracts, lack of readily available contractors, prospects for drilling about 50 offshore wells in the Adriatic Sea, and possibilities for offshore drilling in India and Bangladesh prompted INA to purchase one offshore drilling rig.

*Exploration, Development, and Production.*—INA, in Croatia, and Naftagas, in Serbia, carried out exploration and development drilling for crude oil and natural gas. Both enterprises drilled approximately 254,254 meters (about 814,000 feet) with 19 drilling rigs. A total of 172 wells was drilled; 47 were exploratory and 125 were producing wells.[7] Major exploration drilling was conducted by INA in Medjumurje, Slavonija, and Baranja, and by Naftagas in Banat and Bačka.

In Medjumurje, crude oil was discovered at Mihovljan, near Cakovec, at a depth of 1,800 meters. In Slavonija, discovery of a new gasfield at Bokšić Lug, near Našice, with reserves of 11 billion cubic meters, was confirmed with additional drilling. Drilling was underway at Cadjavicki Lug, near Podravska Slatina, Kućanci, Vladislavci, and Ogod, but results had not been reported at yearend. In all drilling in Slavonija the target depth was over 3,000 meters. In Banat, near the existing Kikinda Fields, a new oilfield and gasfield, Mokrin Zapad, was discovered. In Majdan-Arandjelovo, tests of a new discovery well were underway at yearend. In Banat, depths of exploratory drilling were also more than 3,000 meters, indi-

[7] Number of producing wells include extension wells.

cating a transition of exploratory drilling from shallow to deep wells.

Offshore exploration was carried on by INA in the northern part of the Adriatic Sea and by Jugopetrol-Adria-Kotor, an enterprise jointly owned by Jugopetrol-Kotor of Yugoslavia and Buttes Gas & Oil Co. and Challenger Oil and Gas Co., a wholly owned subsidiary of Global Marine Inc., both of the United States. Results for offshore activities were not made public at yearend. The offshore drilling rig ordered in the Netherlands by INA will be capable of drilling in waters 90 meters deep and to a depth of 6,000 meters.

INA made an effort to participate in exploration in Syria and Bangladesh. INA-Naftaplin concluded a $10 million contract with the Syrian state-owned General Petroleum Co. to drill three wells up to 15,000 feet deep in Syria. A U.S.-made drilling rig, Emsco-Continental 1500, was shipped from Yugoslavia to Syria for the project. About 36 drillers and supervisory personnel from Yugoslavia will operate the rig. Reports indicated that 3 years will be needed to complete the contract. In Bangladesh, offshore geophysics was the principal activity during 1974.

The largest part of Yugoslavia's crude oil and natural gas production came from various oilfields in Croatia. Beničanci, Zutica, and Struzec were the principal ones. In Serbia, the Velebit and Kikinda Fields produced most of the crude oil in that State. Secondary recovery (water flooding) was carried out at the Ivanić oilfield, in Croatia. Facilities for another water flooding project were under construction at the Zutica oilfield.

During November, a tentative plan was made public for future development of INA-Naftaplin. The growth rate for crude oil production was planned at 5.3% per year and that of natural gas at 22.2% per year. Accordingly, crude oil and natural gas output would be 3.4 million tons and 2 billion cubic meters, respectively, by 1980. To reach these production targets, 50 promising areas in the Sava, Drava, and Mura sedimentary basins would be drilled with 190 "wildcat" wells, totaling 500,000 meters of exploratory drilling. Furthermore, exploration in the Dinaric Alps, near the shoreline and inland, Istria, and Ravni Kotari, called for drilling 5 to 6 exploratory wells 3,500 to 5,500 meters deep.

*Refineries.*—Six state-owned refineries processed a total of 10.4 million tons of crude oil during 1974 and operated at 83.4% of installed capacity. Imported crude petroleum accounted for 67.5% of the total throughput.

The following tabulation shows capacities of operating refineries during 1974:

| Location of refinery | Location of operating enterprise | (million metric tons per year) Capacity |
|---|---|---|
| Bosanski Brod | Energoinvest-Sarajevo | 2.5 |
| Lendava | INA-Zagreb | .6 |
| Rijeka | ---- do | 4.5 |
| Sisak | ---- do | 3.6 |
| Novi Sad | Naftagas-Novi Sad | .6 |
| Pancevo | ---- do | 1.4 |
| Total | | 13.2 |

Preliminary plans called for expanding present refinery capacity to 27 million tons per year by 1980. In addition, two refineries, one in Koper, Slovenia, and another in Skopje, Macedonia, were planned for completion early in 1980.

Expansion continued at Naftagas-operated refinery near Novi Sad. When the refinery is completed late in 1975 or early in 1976, it will have a capacity of 1.3 million tons per year. In addition, possibilities were explored to expand the Novi Sad refinery annual throughput capacity to 3 million tons.

Management of the Sisak refinery announced plans for increasing present annual capacity of 3.6 million to 7.5 million tons by 1982.

The planning board of the Rijeka refinery announced targets for future expansion of the refinery's capacity to 8 million tons per year.

The organization Sernim continued preliminary work for construction of its first petroleum refinery, at Koper, Slovenia, on the Adriatic coast. Reports indicated annual capacity ranging from 3 million to 8 million tons. Financing reportedly was

arranged with participation of Kuwait, Libya, and Syria. Products were planned for marketing in central Europe. INA, with its large refinery in nearby Rijeka, has expressed opposition to the project.

Construction of the first petroleum refinery in Macedonia was announced in mid-1974. The 2-million-ton-per-year refinery will be located near Skopje. Equipment for the refinery will be purchased in the U.S.S.R. Imported crude oil will be brought by rail from the port of Thessaloniki, Greece. Financing, except for a lesser part, was assured at yearend.

*Transportation.*—Rail, trucks, river barges, and tankers moved most of the crude oil and products. Only a small part was moved by pipelines. However, steps were taken to make pipelines the principal means for moving crude oil. Preliminary work continued on the first crude oil trunk pipeline. An agreement was signed between INA, Energoinvest, and Naftagas for Yugoslavia, Mineralimpex from Hungary, and Czempol from Czechoslovakia on financing construction and use of the 700-kilometer pipeline. Representatives of these governments signed an agreement guaranteeing construction of the pipeline.

The pipeline will start at Omišalj, on the island of Krk in the north Adriatic, where a new port will be built and will lead to refineries at Rijeka, Sisak, Bosanki Brod, Novi Sad, and Pančevo, with a branch to the Hungarian border and to Lendava. The pipeline will have an annual capacity of 34 million tons, of which 10 million tons are reserved for INA refineries; 5 million tons for the Energoinvest refinery; 9 million tons for Naftagas refineries; and 10 million tons for refineries in Hungary and Czechoslovakia.

INA, Energoinvest, and Naftagas organized an enterprise that will construct the pipeline in two phases. In the initial phase, the pipeline with pumping stations, a port in Omišalj, and storage tanks will be completed in 1976. In the second phase, which will last another 2 years, more storage tanks will be built at Omišalj, and remaining installations will be completed. At yearend, financing of $450 million to $500 million, a sharp increase from the $220 million in preliminary plans, appeared assured, except for $150 million. Yugoslavia will provide $130 million while Hungary and Czechoslovakia will invest $25 million each. The rest will be obtained from Kuwait, an international bank consortium, and the International Bank for Reconstruction and Development.

Preparations for construction of main gaslines were underway in Serbia and Croatia. In Serbia, financial arrangements between domestic banks were concluded for the domestic share of total costs for the 1,268-kilometer trunkline between Senja and Nis. Initial capacity of the pipeline was planned at 2.7 billion cubic meters yearly. In Croatia, a 50-kilometer segment, from Miholjac to Osijek, of the Budrovac-Osijek main gasline was under construction. The gasline will bring natural gas from Bokšić Lug gasfield to Osijek.

Yugoslavia's rail system owned about 3,800 railway tank cars with a total carrying capacity of 127,534 tons. During 1974, approximately 4.5 million tons of crude oil and products were moved by rail.

Road transportation, principally of refinery products, was carried out by 1,680 tank trucks with an aggregate capacity of 47,096 cubic meters.

Transport of crude oil and products on inland waterways was by a total of 168 vessels with total capacity of 172,394 deadweight tons.

Yugoslavia's maritime enterprises owned 34 tankers with 243,266 deadweight tons, but only 7 tankers were over 10,000 deadweight tons. About 15 small seagoing tankers with a capacity of 8,000 deadweight tons were used for transportation of petroleum products along the Adriatic coast.

# The Mineral Industry of Zaire

By George J. Coakley [1]

Zaire continued to be the largest producer of cobalt and industrial diamond in the world and was ranked sixth in mine production of copper. Most of Zaire's exports by value and over half of governmental revenues were derived from production of mineral commodities. Shaba Province in southeastern Zaire was the leading mineral-producing region and accounted for all of the copper, zinc, manganese, coal, byproduct cobalt, cadmium, and germanium output. Kivu Province was the center of columbium-tantalum, gold, tin, and tungsten mining, and Kasai Province was the location of diamond mining.

Announced expansion plans would increase copper and associated cobalt production about 60% by 1980. However, until expected completion in 1977 of a high-voltage, direct-current transmission line from new generating capacity at Inga on the lower Zaire River to Shaba Province, there may be a critical energy shortage that could curtail output. Development of two offshore oilfields discovered between 1970 and 1973 continued during the year with production scheduled to commence in late 1975 at the rate of 25,000 barrels per day.

During 1974 a new government agency was set up to market Zaire's copper output, and the Government stated its intention to refine all domestic copper internally.

In actions attempting to bolster the depressed world copper market, Zaire as a member of the Conseil Intergouvernemental des Pays Exportateurs de Cuivre (CIPEC) agreed to cut all copper exports by 10% effective December 1, 1974.

**Government Policies and Programs.**—Two major political-economic programs were implemented or announced during the year by President Mobutu Sese Seko, which will have long-range impact on the mineral industry of Zaire. The Zairianization measures announced on November 30, 1973, called for the return of ownership of all former colonial properties and enterprises to Zairians. Property developed by noncolonial foreign interests would be taken over and compensated for within 10 years. All new mining concessions must include 50% Zairian participation. All subsidiaries of the Belgian firm Union Minière du Haut Katanga are to become 100% Zairian, starting with the appointment of a Zairian director-general for La Générale des Carrières et des Mines du Zaire (Gécamines) in 1974. It is planned that the percentage of Zairians holding key technical and administrative positions in Gécamines will increase from 36% to 60% by 1980. Two other important decisions for the copper industry implemented under these measures are the creation of a national copper marketing corporation to take over functions previously handled by the Belgian firm Société Générale des Minerais (SGM) and the Government's expressed determination to have the country's entire copper production refined domestically by 1980.

In addition to its mining activities in Shaba Province, Gécamines has been given the additional ownership and administrative responsibility for the provincial hospital, agricultural installations, and flour mill, and in general to provide needed social services to Shaba. Like Gécamines, several new authorities were set up to consolidate and administer activities in tin mining, electrical power, and petroleum distribution. Exempted from these actions were foreign companies such as Société de Dévelopment Industriel et

[1] Physical scientist, Division of Nonferrous Metals.

Minière du Zaire (Sodimiza), Société Minière de Tenke-Fungurume (SMTF), (a consortium of United States, British, French, and Japanese companies and the Government of Zaire) and Zaire Gulf Oil Co. which invested in Zaire and operated under the conditions of the Code of Investment of June 29, 1969.

In addition to the Zairianization measures described above, new "radicalization" measures announced in December 1974 called for the imposition of state control over more than 100 firms of both foreign and Zairian ownership.

Zaire was looking forward to the completion of the Inga hydroelectric project to spur new industrial growth in the country. The new facility will increase the supply of electricity from 2.5 billion kilowatt-hours in 1974 to 105 billion kilowatt-hours in 1978. A key part of the project, the construction of a 1,800 kilometer-long high-voltage transmission line from the Inga Dam near the mouth of the Zaire River to the heart of the copper mining district near Kolwezi, Shaba, met with some delays with completion now expected in 1977 or 1978.

In November the CIPEC ministers met in Paris and agreed to cut back all copper exports effective December 1, 1974, by 10% in comparison with the levels achieved during the previous 6 months. This quota represented a total reduction in the CIPEC countries' shipments of 17,500 tons of copper per month, of which Zaire's share would be 4,000 tons per month.[2]

## PRODUCTION AND TRADE

Mine production of copper continued an upward trend, increasing 2% to a record 499,000 tons in 1974. Other important mineral commodities with mine production increases were cobalt 17%, zinc 1%, and diamond 5%. Production decreases were recorded for coal 10%, silver 15%, gold 5%, manganese 8%, and tin 13%. Details of mineral production are shown in table 1. Export data are shown in table 2. The import data that appeared in the Zaire chapter of the 1972 Minerals Yearbook are the most recent official information available.

[2] Conseil Intergouvernemental des Pays Exportateurs de Cuivre. (CIPEC Annual Report). Copper in 1974. Paris, June 1975, 103 pp.

## Table 1.—Zaire: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| METALS | | | |
| Beryllium, beryl concentrate, gross weight | (1) | (1) | -- |
| Cadmium, smelter production | 296 | 278 | 272 |
| Cobalt: | | | |
| Mine output, metal content | 13,112 | 15,052 | 17,632 |
| Refinery production | 13,043 | 15,052 | 17,545 |
| Columbium-tantalum concentrate | r 102 | 56 | 34 |
| Copper: | | | |
| Mine output, metal content | r 435,741 | 488,567 | 498,865 |
| Blister and leach cathodes | r 428,260 | 460,479 | 467,000 |
| Refined | r 216,200 | 230,164 | 254,500 |
| Germanium, content of concentrates kilograms | (1) | 3,296 | 61,653 |
| Gold [2] troy ounces | r 140,724 | 133,650 | 126,449 |
| Manganese ore and concentrate, gross weight | 369,481 | 333,963 | 308,775 |
| Rare-earth metals, monazite concentrate, gross weight | r 228 | 227 | 237 |
| Silver thousand troy ounces | r 2,078 | 1,995 | 1,694 |
| Tin: | | | |
| Mine output, metal content long tons | r 5,866 | 5,356 | 4,675 |
| Smelter primary e do | r 1,185 | 954 | 617 |
| Tungsten mine output, metal content | 287 | 242 | 174 |
| Zinc: | | | |
| Mine output, metal content | r 99,252 | 88,435 | 88,975 |
| Metal, primary, electrolytic | r 66,652 | 66,026 | 65,670 |
| NONMETALS | | | |
| Cement, hydraulic thousand tons | 476 | 537 | e 380 |
| Diamond: | | | |
| Gem thousand carats | 1,339 | 1,294 | 613 |
| Industrial do | 12,051 | 11,646 | 12,991 |
| Total do | 13,390 | 12,940 | 13,604 |
| Lime e | 110 | 150 | 150 |
| Stone, unspecified thousand tons | NA | e 750 | NA |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal, bituminous do | 128 | 115 | 103 |
| Petroleum refinery products: | | | |
| Gasoline thousand 42-gallon barrels | 945 | 947 | 1,034 |
| Kerosine and jet fuel do | 594 | 563 | 566 |
| Distillate fuel oil do | 1,343 | 1,334 | 1,278 |
| Residual fuel oil do | 2,248 | 2,166 | 1,953 |
| Other: | | | |
| Liquefied petroleum gas do | -- | 25 | 20 |
| Refinery fuel and losses do | 301 | 351 | 278 |
| Total do | 5,431 | 5,386 | 5,129 |

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Revised to none.

[2] Excludes gold recovered from blister copper.

## Table 2.—Zaire: Exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1971 | 1972 | 1973 |
|---|---|---|---|
| Cadmium | 307 | 315 | 295 |
| Cobalt metal, unwrought | 10,553 | 11,375 | 17,144 |
| Columbium-tantalum concentrate | -- | 87 | 48 |
| Copper: | | | |
| Concentrate | -- | 25,000 | 75,000 |
| Metal, unalloyed | 412,302 | 432,318 | 464,168 |
| Diamond thousand carats | (2) | 12,948 | 14,189 |
| Germanium metal, unwrought | 9 | -- | (3) |
| Gold troy ounces | 144,678 | 126,738 | 135,387 |
| Rare-earth metals, monazite concentrate | -- | 246 | 213 |
| Manganese ore | 332,455 | 304,782 | 485,000 |
| Tin: | | | |
| Ore and concentrate long tons | 6,111 | 6,400 | 5,951 |
| Metal, unwrought do | 1,772 | 1,109 | 886 |
| Tungsten, ore and concentrate | 446 | 440 | 403 |
| Zinc: | | | |
| Concentrate | 30,000 | 28,028 | 7,625 |
| Metal, unwrought | 64,293 | 71,174 | 68,814 |

[1] Data for totals reported are official statistics of Zaire as reported in Industrie Minière de La Republique du Zaire, Annual Report, 1973.

[2] Value only reported at US$32,006,000.

[3] Value only reported at US$372,000.

Gécamines copper export revenues were $836 million for 1974, compared with $748 million in 1973.[3] This mineral commodity continued to contribute approximately two-thirds of Zaire's foreign exchange earnings. While the average price received for Zairian export copper in 1974 was about 82 cents per pound, the sharp drop in London Metal Exchange copper quotations from a high of $1.52 in April to $0.53 at yearend represented a significant loss of potential revenue to the economy of Zaire. CIPEC estimated the loss in export revenue to Zaire at $11 million annually for each 1-cent reduction in price, for a total loss of over $600 million in 1974.[4]

## COMMODITY REVIEW

### METALS

**Cobalt, Copper, Zinc, and Associated Metals.**—The Government of Zaire announced its intention to have the country's entire copper production refined domestically by 1980. By that year expansions announced under the second 5-year plan, combined with the two private-government joint venture developments underway in 1974, are scheduled to increase Zaire's annual copper production to 800,000 tons. Zaire produced just under 500,000 tons of copper in 1974. The Government also reached an agreement in principle to compensate Union Minière with a sum of $100 million for the 1967 expropriation of its mines, which are now run by the state agency Gécamines. It was also agreed that a Zairian marketing company formed in July 1974 would take over the copper marketing operations of SGM effective January 1975. SGM, a subsidiary of Union Minière, will train Zairian personnel and will continue to market Gécamines copper until the national company becomes fully operational.

Gécamines operated 3 underground and 6 open pit mines, 5 mills, 1 copper smelter at Lubumbashi, and 2 electrowinning refineries at Luilu and Shituru, all in Shaba Province. The company provided approximately two-thirds of foreign exchange receipts and one-half of government revenues for Zaire during 1974. Gécamines produced all of Zaire's cobalt and zinc and approximately 95% of its copper, representing total sales revenue of over $1 billion. From this amount $452 million was paid to the Government in duties and taxes.

Copper output of Gécamines advanced 2% to 471,100 tons including 324,000 tons of copper in refined shapes. Byproduct gold (4,662 troy ounces) and silver (1.65 million troy ounces) were recovered during metallurgical processing of copper concentrate. The company also produced 17,500 tons of cobalt as a coproduct, principally from its western group of mines, and 68,700 tons of zinc along with 272 tons of cadmium and 61,700 kilograms of germanium from the Kipushi mine and Kolwezi electrolytic zinc plant. During 1974 Gécamines absorbed by government order the assets, rights, liabilities and activities of Société Métallurgique de Kolwezi (SMK), operator of the electrolytic zinc plant, and of another affiliate, Société Generale Industrielle et Chimique de Likasi (SOGECHIM), which produced sulfuric acid from zinc roaster gases for use in the copper industry. Roasted and unroasted zinc concentrates that were in excess of the needs of the Kolwezi zinc plant were available for export.

Gécamines embarked upon a $250 million expansion plan to increase production to 570,000 tons of copper and 18,500 tons of cobalt by 1978. An additional expansion to 600,000 tons of copper by 1980 was contemplated. This plan included construction of two new open pit mines, Dikuluwe and Mashamba, a new concentrator with an annual capacity of 4 million tons of ore, a flash smelting plant with an annual capacity of 125,000 tons of blister copper and 6,000 tons of 55% white alloy cobalt, and a 100,000-ton-capacity electrolytic refinery all located near Kolwezi. A new acid plant will produce 100,000 tons of sulfuric acid yearly. The two new mines, with combined reserves estimated at 171 million tons of 4.1% copper and 0.3% cobalt, are due to open in late 1975. The timing and success of the entire project are heavily dependent on the completion of the transmission line from Inga Dam to Shaba.

[3] Where necessary, values have been converted from the Zairian currency Zaire to U.S. dollars at the rate of Z1.00=US$2.00.

[4] Work cited in footnote 2.

Sodimiza was controlled 20% by the Zaire Government and 80% by a consortium of the eight major Japanese mining companies. During 1974 the original six-member Japanese consortium was joined by Mitsubishi Metal Corp. and The Dowa Mining Co. Ltd. In its second full year of operating the Mushoshi mine and mill in Shaba Province, Sodimiza increased mine production 10% to 1.5 million tons of ore. Production of 77,000 tons of concentrate with an average copper content of 36% yielded 27,700 tons of contained copper. Most of the concentrate was exported via Lobito, Angola, for smelting and refining in Japan. Sodimiza continued development of the Kinsenda mine during the year, seeking the most suitable mine design to exploit an irregular-shaped ore body and to control serious ground water problems. Production was not expected to begin before 1977 or 1978. Previous estimates placed ore reserves at 100 million tons of 3.5% copper at Mushoshi with 35 million tons of 5.5% copper at Kinsenda.

Sodimiza conducted exploration at two other sites, Mokambo and Kilela-Balanda, where copper deposits have been discovered. All of the mining and exploration activities are contained in a 36,000-square-kilometer concession in southeastern Shaba near the Zambian border. Under the terms of the agreement this concession was reduced by 50% during 1974 to be followed by a 50% reduction of the remainder in 1975.

SMTF continued construction and development of the Tenke-Fungurume project during the year. The scheduled startup date for the planned 150,000-ton-capacity refinery may be delayed past 1977 pending completion of the new Inga transmission lines. Inflation raised the cost of the SMTF project to over $700 million. Reserves of mixed oxide and sulfide ore were estimated at 48 million tons of 5.4% copper and 0.42% cobalt. SMTF plans to use a process involving the conversion of sulfides to oxides prior to recovery of copper by leaching, solvent extraction, and electrowinning.

**Columbium-Tantalum, Gold, Tin, and Tungsten.**—Production of tin contained in cassiterite concentrate in Zaire decreased 13% to 4,675 long tons. Zairetain, 50% owned by the Zairian Government and 50% by Compagnie Géologique et Minière des Ingénieurs et Industriels Belges (GEOMINES), expanded capacity at its Manono mine located in north-central Shaba Province to 100 long tons of concentrate per month in mid-1974. Expansion to 150 long tons per month will be completed in 1975 by recommissioning a washing plant. The mine had reserves for 3 to 4 years of operation at the higher rate. During 1974 the company's four open pit mines produced 1,045 long tons of cassiterite and 30 tons of tantalite. From the former it produced 685 long tons of refined tin ingot for export through the Angolan port of Lobito.

Syndicat Minière de l'Etain (SYMETAIN) is Zaire's largest producer of tin and a major producer of tungsten. Its main production areas are at Kalima and Punia in the Maniema District of Kivu Province. In 1974 SYMETAIN produced 2,484 long tons of tin concentrate and 5 tons of tungsten concentrate.

Cobelmin-Zaire (Cobelmin), a subsidiary of Compagnie Belge d'Enterprises Minières, operated concessions in Kivu Province owned by five smaller mining companies. These companies were Compagnie Minière des Grand Lacs (MGL), Kinoretain, Kindamines, Minerga, and Miluba. Cobelmin's production in 1974 included 18,734 troy ounces of gold, 2,788 long tons of tin concentrate, 28 tons of columbium-tantalum, 290 tons of tungsten concentrate, and 106 tons of thorium concentrate.

A plan was agreed upon to consolidate the major mining companies in Kivu Province into one operating company, with Cobelmin to assume administration of Kivumines, Phibraki, and Somikubi during 1974. It was expected that SYMETAIN will be merged into the group during 1975. A significant participation by the Zairian Government was also expected. The name proposed for the merged firms was Société Minière et Industrielle du Kivu (Sominki).

**Manganese.**—Société Minière de Kisenge operated three open pit manganese mines at Kisenge near the Angolan border. Most of the output was a manganese oxide product containing 48% to 55% manganese; 309,000 tons was produced in 1974, a decrease of 8% from 1973.

## NONMETALS

**Cement.**—Cimenteries du Shaba (Cimshaba), Société des Ciments du Congo (CICO), Ciments Metallurgiques de Likasi

(CML), and Ciments-Lacs operated cement plants and produced a total of 380,000 tons of cement, compared with 537,000 tons in 1973. Cimshaba, one of the major cement companies, produced 91,650 tons of cement, up 16% over 1973; 12,000 tons of lime, up 50%; and 10,200 tons of ballast. These materials were consumed domestically, with Gécamines being a principal user. A shortage of railroad cars and cement bags created severe distribution problems during the year.

**Diamond.**—Production of diamond was 13.6 million carats compared with 12.9 million carats in 1973. Société Minière de Bakwanga (MIBA), located at Mbuji Mayi, East Kasai region, was the principal producer of diamond, mostly of industrial quality. The 1974 production increase of nearly 1 million carats is attributed to improved output from MIBA's crushing bort operation at Lubilash. In November 1973 the Government announced its intention to take over operation of the MIBA diamond mines.

## MINERAL FUELS

**Coal.**—La Société des Charbonnages de la Luena operated a coal mine about 45 miles northwest of Lubudi in southwest Shaba. Production was 103,000 tons, a 10% decline from that of 1973. Peak production was 429,000 tons in 1955; output since then has declined, largely owing to development of hydroelectric power in the region and electrification of the railroads. Also Luena coal is not suitable for coking, and coal for that purpose was imported. Principal consumers of Luena coal were Gécamines and Cimenteries de Lubudi. In connection with Gécamines' expansion plans, a new Lurgi coal gasification plant was expected to increase demand for Luena coal.

**Petroleum.**—Two offshore oilfields were scheduled to be brought into production in 1975 by a consortium of United States, Belgian, and Japanese companies in which Gulf Oil Zaire holds a 50% equity. Initial production of 25,000 barrels per day of high-quality, low-sulfur oil was to begin in late 1975. Discovery wells were drilled in one structure in 1970 and in another structure in 1973. About $25 million was expended in exploration and appraisal of the offshore area through 1973. An estimated $30 million to $35 million was planned to be invested in 1974 and 1975 before the start of production.

Texaco Inc., Royal Dutch/Shell Group (Shell), Mobil Oil Corp., Petrofina, S.A. and Global Energy had licenses to explore for oil in Zaire, chiefly onshore in the central Zaire River Basin and in Bas Zaire. The Government of Zaire reserved the right to participate in the projects at a later date.

The Government, in equal partnership with Italy's Ente Nazionale Idrocarburi (ENI), operates the Sozir petroleum refinery at Moanda, which supplies about 50% of the country's refined petroleum needs. According to plans, annual production at the Sozir refinery was to be increased to 25,000 barrels per day during 1973–74 from the 1972–73 output of 15,000 barrels per day of refined petroleum products. In December 1973 the Government nationalized the marketing facilities of Mobil Oil Co., Texaco Inc., Petrofina, S.A., and Shell, placing marketing operations under control of the Ministry of Energy and a new government agency Petrozaire. This action did not affect investments made by the foreign oil companies in the areas of new exploration and production.

# The Mineral Industry of Zambia

By Gertrude N. Greenspoon [1]

Although efforts to lessen Zambia's dependence on copper as the main source of national income continued in 1974, copper mining contributed over 40% to the value of the gross domestic product (GDP) and accounted for 94% of total export value. Copper is expected to continue as the principal national income earner. Progress continued in developing small mines as expansion plans were made for the Lochinvar gypsum mine and a new mine for the production of feldspar and fluorspar opened in 1973 near Kariba.

Transport problems resulting from the border closure with Southern Rhodesia in 1973 continued. Congestion occurred at the ports of Dar es Salaam, Tanzania; Mombasa, Kenya; and Lobito, Angola. The completion of the Tanzania-Zambia Railway (Tazara), expected by mid-1975, will increase Zambia's trade capacity. The railway crossed into Zambia in August 1973 and on completion will join Zambia's existing railway at Kapiri Mposhi. Most of Zambia's exports and imports will be routed over Tazara to the Tanzanian port of Dar es Salaam.

On March 1, a retirement benefit plan was incorporated in the labor agreement reached with the Mineworkers' Union of Zambia in November 1973. The contract is for 3 years.

## PRODUCTION

The value of mineral production totaled $1,456 million,[2] a 19% increase over that of 1973. Mine production of copper fell 1% but smelter and refinery outputs rose 3% and 6%, respectively. Mine production of lead was unchanged from 1973 but zinc output rose 10% over that of 1973. Production of cobalt metal fell from 2,664 tons to 2,374 tons. Coal production was 14% less than that in 1973.

## TRADE

Continued improvement was recorded in Zambia's trade surplus in 1973. Copper prices continued the strong upward trend that began in the last quarter of 1973 and reached a record $3,366 per ton on April 1, 1974. This together with reduced imports, because of transport problems, resulted in a $616.3 million surplus, nearly triple that in 1972 and the largest since 1969.

The value of total trade and mineral trade, in million dollars, follows:

| | Mineral commodity trade | Total commodity trade |
|---|---|---|
| Exports: | | |
| 1971 | 658.6 | 679.2 |
| 1972 | 813.5 | r 844.8 |
| 1973 | 1,131.4 | 1,157.4 |
| Imports: | | |
| 1971 | 55.8 | 559.0 |
| 1972 r | 53.8 | 627.8 |
| 1973 | 60.4 | 541.1 |

r Revised.

Mineral exports from Zambia in 1973 were valued at $1,131 million, 39% more than those in 1972. Copper exports valued at $1,089 million, 94% of total exports, continued as the leading exchange earner, followed by zinc, lead, and cobalt. These four commodities accounted for 98% of the total exports in 1973. For the fourth consecutive year, Japan was Zambia's major market.

The value of imports in 1973 was $541.1 million, 14% less than that in 1972. Mineral commodities accounted for $60 million, of which $52 million was for mineral fuels.

[1] Mineral specialist, Division of Nonferrous Metals.

[2] Where necessary, values have been converted from the Zambian currency kwacha (K) to U.S. dollars at the rate of K1.00=US$1.56.

## Table 1.—Zambia: Production of mineral commodities

(Metric tons unless otherwise specified)

| Commodity [1] | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| METALS | | | | |
| Cadmium metal | | 16 | 15 | 13 |
| Cobalt: | | | | |
| Mine output, metal content | | [r] 3,345 | [r e] 3,140 | [e] 3,170 |
| Metal | | [r] 2,056 | 2,664 | 2,374 |
| Copper: | | | | |
| Mine output, metal content of concentrate | | 717,700 | 706,574 | 697,956 |
| Blister and anodes, copper content | | [r] 700,025 | 681,200 | 702,100 |
| Refined | | 615,222 | 638,509 | 676,854 |
| Gold [2] | troy ounces | 8,858 | 1,608 | 5,755 |
| Lead: | | | | |
| Mine output, lead content | | 31,400 | 25,300 | 25,200 |
| Metal, refined | | 26,005 | 25,012 | 24,496 |
| Silver [3] | | 1,184 | 79 | 287 |
| Tin, concentrate, gross weight | | 7 | 8 | 11 |
| Zinc: | | | | |
| Mine output, zinc content | | 70,500 | 73,200 | 80,500 |
| Smelter (electrolytic) | | [r] 55,983 | 53,355 | 58,358 |
| NONMETALS | | | | |
| Cement, (hydraulic) | thousand tons | 485 | 412 | [e] 380 |
| Clay | do | 226 | NA | NA |
| Feldspar | | -- | 12 | 1,777 |
| Fluorspar | | -- | 7 | 460 |
| Gemstones: | | | | |
| Amethyst | kilograms | 46,125 | 91,500 | 37,425 |
| Beryl | do | 172 | -- | 11 |
| Emerald | do | 15 | -- | NA |
| Gypsum | | [e] 100 | 480 | 3,771 |
| Lime, hydraulic and quick [e] | thousand tons | 104 | 110 | 110 |
| Stone, sand and gravel: | | | | |
| Stone: | | | | |
| Limestone | do | [r] 985 | 978 | 840 |
| Phyllite | do | [r] 88 | 75 | NA |
| Sand | | 670 | NA | NA |
| Sulfur | | 30,390 | 32,256 | [e] 35,000 |
| Talc | | [r] 4,450 | 1,750 | 138 |
| MINERAL FUELS AND RELATED MINERALS | | | | |
| Coal, bituminous | thousand tons | 937 | 940 | 810 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, manganese ore was known to have been mined in 1973, and may have been mined in 1971 and 1972 as well, but output was not quantitatively reported and no basis for estimation exists. In 1970, the last year for which manganese ore production was reported, 6,081 tons were produced.

[2] Chiefly contained in blister copper, refinery muds, and electrolytic copper.

[3] Refined silver and silver contained in blister copper, refinery muds, and electrolytic copper.

## Table 2.—Zambia: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum, including alloys, all forms | 729 | 763 | Republic of South Africa 620; Zaire 142. |
| Cadmium metal, unwrought | 15 | 6 | All to Republic of South Africa. |
| Cobalt metal, unwrought | 2,329 | 1,145 | United Kingdom 748; People's Republic of China 200; Poland 60. |
| Copper: | | | |
| Ore and concentrate | 18,116 | -- | |
| Copper bearing residues | 2,005 | 1,449 | Belgium-Luxembourg 1,001; Japan 448. |
| Metal: | | | |
| Scrap | 447 | -- | |
| Unwrought: | | | |
| Unrefined blister | 87,741 | 43,071 | Japan 18,449; United Kingdom 10,924; Yugoslavia 6,030. |
| Refined: | | | |
| Wire bar | 548,448 | 521,259 | United Kingdom 115,550; Japan 114,905; Italy 73,772; West Germany 47,229. |
| Cathode | 72,635 | 104,206 | Japan 40,735; West Germany 23,009; France 21,814; United Kingdom 8,673. |
| Total | 621,083 | 625,465 | |
| Semimanufactures | 389 | 66 | Kenya 54; Pakistan 12. |

See footnote at end of table.

## Table 2.—Zambia: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel, metal: | | | |
| Scrap | 6 | (1) | All to Zaire. |
| Semimanufactures, including ferroalloys | 40 | 84 | Zaire 27; Botswana 19. |
| Lead: | | | |
| Oxide | 280 | 73 | Zaire 45; Malawi 28. |
| Metal, unwrought and semimanufactures | 26,694 | 20,012 | Italy 6,550; Republic of South Africa 4,869; Yugoslavia 2,340. |
| Platinum-group metals and silver: | | | |
| Ore and concentrate | 1 | -- | |
| Metal, including alloys troy ounces | -- | 1,398 | All to United Kingdom. |
| Zinc metal: | | | |
| Scrap | 185 | 179 | All to Republic of South Africa. |
| Unwrought | 60,572 | 51,115 | Yugoslavia 20,301; Chile 6,609; Italy 5,210. |
| Other, base metals, including alloys all forms, n.e.s | (1) | 13 | All to Zaire. |
| NONMETALS | | | |
| Abrasives, natural dust and powder and semiprecious stone except diamond, value | $21,988 | -- | |
| Cement | -- | 282 | Botswana 280. |
| Feldspar | 20 | -- | |
| Fertilizer materials, nitrogenous | 299 | 300 | All to Zaire. |
| Lime | 3,455 | 514 | Do. |
| Precious and semiprecious stones, except diamond value, thousands | $1,050 | $1,669 | Hong Kong $762; West Germany $672; United Kingdom $149. |
| Stone, sand and gravel: | | | |
| Stone: | | | |
| Limestone | 144 | -- | |
| Crushed and broken | 814 | 13,108 | Zaire 12,941. |
| Sand, not metal bearing | -- | 15 | All to Botswana. |
| Talc | 1,705 | 767 | All to Republic of South Africa. |
| Other slag, dross, and similar waste, not metal bearing | 460 | 104 | All to United States. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Petroleum: | | | |
| Partly refined 42-gallon barrels | -- | 2 | All to Tanzania. |
| Refinery products: | | | |
| Gasoline do | 21 | 306 | Do. |
| Kerosine do | 16 | 1 | Do. |
| Distillate do | -- | 463 | Do. |
| Lubricants do | 3 | -- | |
| Bituminous mixtures do | 629 | 1,704 | Tanzania 1,701; Botswana 3. |
| Other do | 3 | (1) | All to Zaire. |
| Total do | 672 | 2,474 | |
| Mineral tar and other coal, petroleum or gas derived crude chemicals | -- | 7 | All to Zaire. |

[1] Less than ½ unit.

## Table 3.—Zambia: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal, unwrought and semimanufactures | 835 | 769 | Tanzania 257; United Kingdom 134; Netherlands 104. |
| Antimony: | | | |
| Ore and concentrates | -- | 8 | All from People's Republic of China. |
| Powder | -- | 120 | All from United Kingdom. |
| Chromium: | | | |
| Chromite | 79,152 | 3 | All from Republic of South Africa. |
| Metal, including alloys, all forms | -- | 112 | Do. |
| Cobalt metal, including alloys, all forms | 1 | (1) | |
| Copper: | | | |
| Copper sulfate | 176 | 159 | Republic of South Africa 139; United Kingdom 20. |
| Metal, including alloys, all forms | 763 | 438 | Republic of South Africa 300; United Kingdom 50; Zaire 39. |

See footnotes at end of table.

## Table 3.—Zambia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel: | | | |
| Ore and concentrate, except roasted pyrite | -- | 78 | All from Republic of South Africa. |
| Roasted pyrite | 242 | 120 | Do. |
| Metal: | | | |
| Scrap | 20,999 | 5,803 | United States 2,937; United Kingdom 2,817. |
| Pig iron, ferroalloys, and similar materials | 1,881 | 1,113 | Republic of South Africa 867; Belgium-Luxembourg 100. |
| Steel, primary forms | 2,404 | 2,504 | Japan 2,502. |
| Semimanufactures | 108,949 | 86,812 | Japan 33,651; Republic of South Africa 17,920; United Kingdom 12,452. |
| Lead: | | | |
| Oxides | 12 | 28 | All from United Kingdom. |
| Metal, including alloys, all forms | 36 | 39 | United Kingdom 19; Republic of South Africa 16. |
| Nickel metal, including alloys, all forms | 6 | 10 | People's Republic of China 7; United Kingdom 2; Sweden 1. |
| Platinum-group metals, including alloys, all forms troy ounces | 826 | 722 | United Kingdom 720. |
| Silver metal, including alloys -- do | 5,603 | 3,289 | Republic of South Africa 1,614; United Kingdom 1,315; West Germany 360. |
| Tin metal, including alloys, all forms long tons | 53 | 87 | Republic of South Africa 47; United Kingdom 25; Malaysia 8. |
| Titanium oxides | (2) | 140 | United Kingdom 70; West Germany 39; Republic of South Africa 20. |
| Zinc: | | | |
| Oxide | (2) | 150 | United Kingdom 115; Republic of South Africa 20. |
| Metal, including alloys, all forms | 53 | 3 | Mainly from United Kingdom. |
| Other: | | | |
| Ore and concentrate | 78 | 1 | All from Tanzania. |
| Ash and residue containing nonferrous metals | 418 | 6 | All from Republic of South Africa. |
| Metals, including alloys, all forms n.e.s | 44 | 189 | United Kingdom 164. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | (2) | (2) | Mainly from United Kingdom. |
| NONMETALS | | | |
| Abrasives: | | | |
| Pumice, emery, natural corundum, etc. | 6 | (2) | All from United Kingdom. |
| Grinding and polishing wheels and stones | 141 | 63 | Republic of South Africa 23; West Germany 19; United Kingdom 9. |
| Asbestos | 2,430 | 3,322 | Republic of South Africa 2,085; Swaziland 1,237. |
| Barite | 96 | 1 | All from United Kingdom. |
| Boron: | | | |
| Crude natural borates | 102 | 65 | Do. |
| Oxide and acid | 3 | (2) | Mainly from United Kingdom. |
| Bromine | 38 | 29 | Israel 18; United Kingdom 11. |
| Cement | 22,356 | 3,512 | People's Republic of China 2,030; Republic of South Africa 702. |
| Chalk | 165 | 187 | United Kingdom 182. |
| Clay and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Fire clay | 51 | 20 | Italy 11; Republic of South Africa 8. |
| Fuller's earth | 2 | 41 | All from United Kingdom. |
| Kaolin | 71 | 141 | United Kingdom 111; Republic of South Africa 30. |
| Other | 1,053 | 1,959 | Republic of South Africa 1,406; United States 368. |
| Products, refractory (including nonclay brick) | 53 | 531 | Republic of South Africa 526. |
| Diamond, industrial --thousand carats | 21,010 | 16 | United Kingdom 14. |
| Diatomite and other infusorial earths | 778 | 236 | United States 109; Kenya 59; United Kingdom 49. |

See footnotes at end of table.

## Table 3.—Zambia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Feldspar and fluorspar | 18 | 10 | All from Kenya. |
| Fertilizer materials: | | | |
| Crude phosphatic | 180 | 335 | People's Republic of China 200; United Kingdom 50. |
| Manufactured: | | | |
| Nitrogenous | 75,152 | 91,505 | Republic of South Africa 51,104; Italy 23,530; Netherlands 8,355. |
| Phosphatic | 47,649 | 3,480 | All from Republic of South Africa. |
| Potassic | 326 | 979 | Do. |
| Other, including mixed | 2 | 2 | All from United Kingdom. |
| Ammonia | 1 | 2 | All from West Germany. |
| Graphite, natural | 1 | 1 | Mainly from United Kingdom. |
| Gypsum and plasters | 33,211 | 926 | Republic of South Africa 820; Yugoslavia 88. |
| Magnesite | 488 | 17 | Republic of South Africa 15; Austria 2. |
| Mica, all forms | 1 | 9 | India 7; United Kingdom 2. |
| Pigments, mineral, including processed iron oxides | 169 | 147 | United Kingdom 99; United States 36; West Germany 11. |
| Precious and semiprecious stones, except diamond ——— value, thousands | $20 | $26 | United Kingdom $12; Zaire $11; West Germany $2. |
| Salt | 23,126 | 33,987 | United Kingdom 12,310; Mozambique 10,449; Angola 4,402. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 1,778 | 2,623 | West Germany 1,018; United Kingdom 992. |
| Caustic potash | 26 | 13 | All from Belgium-Luxembourg. |
| Soda ash | 333 | 636 | Kenya 443; West Germany 167. |
| Stone, sand and gravel: | | | |
| Stone: | | | |
| Dimension stone | 251 | 9 | Kenya 5; Republic of South Africa 4. |
| Dolomite | 9 | 270 | All from Republic of South Africa. |
| Gravel and crushed rock | 51 | 265 | People's Republic of China 200; United Kingdom 65. |
| Limestone (except dimension) | 32 | 1,838 | All from Republic of South Africa. |
| Quartz | 23 | -- | |
| Sand, excluding metal bearing | 381 | 57 | Australia 50; United Kingdom 5. |
| Sulfur: | | | |
| Elemental, all forms | 15,204 | 15,427 | Iran 5,000; Canada 4,792; France 4,500. |
| Sulfuric acid | 7,426 | 1,139 | Tanzania 720; Republic of South Africa 228. |
| Talc and steatite | 51 | 74 | France 37; India 32. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 2 | 2 | All from Republic of South Africa. |
| Slag, dross and similar waste, not metal bearing | 65 | 104 | All from United States. |
| Oxides and hydroxides of magnesium, strontium, and barium | (2) | (2) | Mainly from West Germany. |
| Building materials of asphalt, asbestos, and fiber cement and unfired nonmetals n.e.s | 375 | 371 | Republic of South Africa 231; Sweden 54. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 12,293 | 753 | Kenya 409; Iran 242; United Kingdom 64. |
| Coal and coke, including briquets | 100,155 | 60,462 | Southern Rhodesia 28,318; West Germany 21,694; Republic of South Africa 10. |
| Petroleum: | | | |
| Crude thousand 42-gallon barrels | -- | 4,811 | All from Iran. |
| Refinery products: | | | |
| Gasoline ——— do | 1,392 | 670 | Iran 642; Tanzania 14; Saudi Arabia 14. |
| Kerosine ——— do | 75 | 68 | Iran 64; Saudi Arabia 4. |
| Jet fuel ——— do | 47 | 35 | Iran 34. |
| Distillate fuel oil ——— do | 2,158 | 1,019 | Iran 977; Saudi Arabia 22. |
| Residual fuel oil ——— do | (2) | 5 | All from Kenya. |
| Lubricants ——— do | 8,011 | 201 | United Kingdom 92; Kenya 79. |

See footnotes at end of table.

Table 3.—Zambia: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum—Continued | | | |
| Refinery products—Continued | | | |
| Other: | | | |
| Mineral jelly and wax thousand 42-gallon barrels | 4 | 27 | People's Republic of China 9; Japan 6; Singapore 3. |
| Unspecified do | 40 | 25 | Iran 7; Kenya 6; Tanzania 5. |
| Total do | 11,727 | 2,050 | |
| Mineral tar and other coal, petroleum or gas derived crude chemicals | 505 | 89 | Republic of South Africa 43. |

[1] Value only reported at US$2,055, mainly from United Kingdom.
[2] Less than ½ unit.

## COMMODITY REVIEW

### METALS

**Copper.**—Smelter production of copper rose 3% over that in 1973 and was slightly in excess of the record output in 1969. Mine production dropped for the second successive year and was 1% below that in 1973. Refinery output increased 6% continuing the upward trend begun in 1972.

Mine production of copper by Roan Consolidated Mines Ltd. (RCM) for the year ended June 30, 1974, was 5% higher than that in the same period of 1973. Output by mine, in tons, was as follows:

| Mine | 1973 | 1974 |
|---|---|---|
| Mufulira | 120,700 | 128,500 |
| Luanshya (includes Baluba) | 84,700 | 89,300 |
| Chambishi | 36,200 | 43,700 |
| Chibuluma | 22,600 | 17,900 |
| Kalengwa | 12,200 | 11,700 |
| Total | 276,400 | 291,100 |

Increased output at Mufulira reflected continued recovery efforts from the 1970 accident. At Luanshya higher output from the Baluba section and more ore mined and treated at Chambishi together with increased copper content of the ore resulted in increased outputs. Production from Chibuluma was adversely affected by a decline in grade of ore mined. Refined copper production totaled 281,000 tons, of which 245,100 tons was wirebars, 28,500 tons cathodes, and 7,500 tons was leach cathodes.

Ore production at Mufulira totaled 6.94 million tons averaging 2.16% copper (6.37 million tons and 2.18% in 1973). Smelter production, including concentrates and materials from other mines, was 156,300 tons of anodes. Production of wirebars totaled 110,800 tons. In the smelter, the reverberatory furnaces were converted from coal to heavy fuel oil, and both wirebar furnaces in the refinery were also using heavy fuel oil.

At Luanshya, 7.26 million tons (6.49 million tons in 1973) was mined, including 1.11 million tons from Baluba. Smelter production was 124,800 tons. A total of 1.80 million tons of ore, including 1.57 million tons of sulfide ore was produced from the Chambishi open pit mine. In addition, 145,000 tons was produced from underground operations. The vat leach plant and the Chambishi and Mufulira concentrators treated 2.04 million tons of ore. Treatment of ore at Mufulira ceased in November 1973 when expansions to the Chambishi concentrator were completed.

The Chibuluma operations produced and treated 648,000 tons of ore averaging 2.74% copper and 0.12% cobalt; and 72,000 tons of 2.84% copper ore was

sent to RCM smelters as converter flux. The Kalengwa mine produced 190,000 tons of ore; 108,000 tons was treated, and ore and concentrate produced contained 11,700 tons of copper.

Output at the Ndola Copper Refinery rose for the second successive year. Cathodes produced totaled 137,300 tons (133,200 tons in 1973), and the casting plant produced 169,700 tons of wirebars (156,600 tons in 1973).

Ore reserve data for the RCM group at the end of June 1974 follows:

| Mine | Ore (thousand metric tons) | Copper (%) |
|---|---|---|
| Luanshya | 141,797 | 2.58 |
| Mufulira | 140,697 | 3.22 |
| Chambishi | 43,177 | 2.93 |
| Chibuluma | 8,173 | 4.74 |
| Kalengwa | 1,231 | 6.67 |

Development of Kalulushi East, south of Chibuluma, continued. Ore reserves were estimated at 3.8 million tons averaging 4.15% copper. Application for a mining license has been made, and it is estimated that about $25 million will be needed to bring the mine into production. Production is scheduled for 1979 when the ore supply from the two shafts at Chibuluma will begin to decline. Ore production at the two shafts will cease in 1981 at which time the Kalulushi East will be in full production.

RCM was preparing to construct a plant to recover precious metals from the electrolytic refinery slimes produced at its refinery and at Nchanga Consolidated Copper Mines, Ltd. (NCCM). This material is now shipped abroad for treatment.

NCCM produced 408,800 tons of copper in the year ended March 31, 1974, compared with 440,000 tons in the same period of 1973. Smelter and leaching plant output totaled 403,900 tons. In addition, 9,100 tons was produced at RCM plants and total output was 413,000 tons.

A total of 5.9 million tons of ore was produced by the Rokana division, of which 57% was from the Mindola ore body. The concentrator treated 5.7 million tons of underground ore and produced 285,400 tons of copper concentrate averaging 30.63% copper and 0.67% cobalt and 53,600 tons of cobalt concentrate containing 6.69% copper and 4.51% cobalt. In addition, the concentrator treated 47,000 tons of ore from open pit operations, and the Torco plant treated 163,200 tons of ore. Output of anode and blister copper was 286,700 tons, and refinery production totaled 324,000 tons. Heavy fuel oil burning facilities were installed on the reverberatory furnaces during the year, and two units in the refinery tankhouse were converted to periodic current reversal operations.

At the Bwana Mkubwa open pit mine, 854,000 tons of ore averaging 3.27% copper was mined. The concentrator treated 677,400 tons of ore and produced 97,200 tons of concentrate containing 16.47% copper. Copper contained in concentrate was 16,000 tons.

The Chingola division produced 9.8 million tons of 3.54% copper ore of which 6.7 million tons came from the Nchanga, Chingola, Mimbula, and Fitula open pit operations. The remainder was from the Lower and Upper underground mines. The Konkola concentrator treated 1.5 million tons of Chingola ore and produced 25,200 tons of 50.79% copper sulfide concentrate and 113,200 tons of 18.22% copper oxide concentrate. The high-grade leach plant produced a record 111,400 tons of copper, but delays due to shortage of construction materials affected production at the low-grade leach plant. Stage I, the cementation plant, operated until November 1973, and in December the first phase of Stage II, the solvent extraction plant, was brought into production. The entire Stage II of the plant was expected to be operational in September 1974, with the complete plant in operation in October.

Ore mined and milled at the Konkola division totaled 1.7 million tons of ore and yielded 47,100 tons of copper in concentrate.

The decision was made to proceed with reopening of the Kansanshi mine. The mine is located near Solwezi in Northwestern Province and was closed after flooding in 1957. Operations will consist of an open pit mine and a leach, solvent extraction, and electrowinning plant. About

26,000 tons of copper will be produced annually. Operations were expected to begin in late 1977 and the project will cost about $70 million.

Ore reserve data for the NCCM group at yearend 1973 follows:

| Mine | Ore (thousand metric tons) | Copper (%) |
|---|---|---|
| Chingola | 254,130 | 3.45 |
| Bancroft (Konkola) | 126,048 | 3.56 |
| Nkana (Rokana) | 122,006 | 2.51 |
| Bwana Mkubwa (Rokana) | 3,887 | 3.62 |

In addition to the expansion plans of the two copper mining groups, Geomin, a Romanian-based mineral development company, in a joint venture with Mindeco, Ltd., formed a new company, Mikambo Development Co., Ltd., to investigate the feasibility of beginning operations at Mokambo near the Zairian border. The mine is believed to contain sufficient ore to provide 15,000 tons of copper in concentrate annually for about 12 years.

**Lead and Zinc.**—The Broken Hill division of NCCM produced 444,900 tons of lead-zinc ore, 25% more than that in 1973. The increase resulted from greater tonnage of ore mined to compensate for the declining ore grade in the deeper levels of the mine. The concentrator treated 422,200 tons of ore containing 8.5% lead and 19.2% zinc, and produced 24,000 tons of lead concentrate averaging 44.8% lead and 35,800 tons of zinc concentrate averaging 58.7% zinc. Production of lead and zinc totaled 25,000 tons and 56,300 tons, respectively, in the year ended March 31, 1974. Reserves at Broken Hill at the end of 1973 totaled 3.3 million tons averaging 23.8% zinc and 10.7% lead.

Difficulty in obtaining steel supplies will delay completion of the Waelz kiln project by nearly 3 months. The new plant was originally scheduled for operation in early 1975.

**Other Metals.**—Cobalt production at the Rokana plant totaled 1,870 tons in the year ended March 31, 1974. The decreased output was due to reduced receipts of cobalt hydroxide from Chambishi division (RCM). The Rokana smelter produced 117,700 tons of byproduct sulfuric acid (100% equivalent) and the Luanshya smelter produced 38,700 tons. Treatment of stockpiled crude silver materials twice during the year at the Broken Hill division yielded 176,118 ounces of silver.

## NONMETALS

The Rokana division cobalt plant produced 13,800 tons of gypsum. Proven and indicated reserves at the Nampundwe sulfur mine totaled 10.9 million tons averaging 16.6% sulfur and 0.63% copper at yearend 1973. The concentrator milled 192,800 tons of ore and produced 81,200 tons of concentrate containing 40.6% sulfur and 2.61% copper.

The Lochinvar gypsum mine in the Kafue Plain will increase output from 500 to 2,000 tons per month when electric power becomes available from the Zambia Electricity Supply Corp. The feldspar-fluorspar operation near Kariba which began production at yearend 1973 has an estimated life of 10 to 15 years and will supply the requirements for the Kapiri Mposhi glass factory which became operational at the end of 1973.

## MINERAL FUELS

The Indeni Petroleum Refining Co., Ltd. oil refinery which became operational in mid-1973 was expected to reach design capacity of 1.1 million tons annually by about 1982–83. Industrial growth in Zambia and the general development in recent years were greater than anticipated and this capacity will now be attained in 1977–78. The Tazama pipeline capacity was increased to 1.1 million tons in line with the refinery. Both projects are under consideration for expansion to about 1.5 million tons annually, and it is estimated that this will satisfy Zambia's requirements to about 1983.

# The Mineral Industry of the Islands of the Caribbean

By Staff, Bureau of Mines

## CONTENTS



## BAHAMAS [1]

Development of the Bahamas as a port, transshipment terminal, and refining center was significantly more important during 1974. The largest single industrial enterprise on the island is the Bahamas Oil Refining Co. (BORCO) refinery in Freeport, which processes 500,000 barrels per day of oil, and has storage facilities for over 18 million barrels of crude oil and petroleum products. Imported crude was valued at approximately $1.5 billion; the main suppliers were Iran, Saudi Arabia, Nigeria, and Gabon. Trinidad was the leading supplier of refined products. According to Ocean Industries, Inc., aragonite production was valued at $1.8 million. Cement production was reported at 794,000 tons; its principal market is in the southeastern United States.

Burmah Oil Bahamas Ltd. expects its transshipment terminal at South Riding Point on Grand Bahama Island to be fully operational in 1975. The terminal is capable of handling 100 million barrels per year of oil, which will gradually increase to a capacity of 200 million barrels over a 2-year period. Supertankers of up to 440,000 deadweight tons are able to berth at this facility and discharge their cargo directly into smaller tankers of up to 80,000 deadweight tons. When smaller tankers are not available, the oil can be pumped through two 36-inch-diameter submarine pipelines connecting the terminal to the onshore storage facilities. The inner harbor is the second major part of the onshore facilities; with a depth of 42 feet, it will accommodate small tankers.

[1] Prepared by Fay D. Dillard, mineral specialist, Division of Petroleum and Natural Gas.

**Table 1.—Islands of the Caribbean: Production of mineral commodities**

| Area, commodity, and unit of measure [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| ANTIGUA [2] | | | |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels | [e] 680 | 495 | NA |
| Jet fuel and kerosine ---- do | [e] 543 | 407 | NA |
| Distillate fuel oil ---- do | [e] 746 | 773 | NA |

See footnotes at end of table.

## Table 1.—Islands of the Caribbean: Production of mineral commodities—Continued

| Area, commodity, and unit of measure [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **ANTIGUA—Continued** | | | |
| Petroleum refinery products—Continued | | | |
| Residual fuel oil ---------- thousand 42-gallon barrels | [e] 2,664 | 2,450 | NA |
| Other, including refinery fuel and losses ------- do | [e] 267 | 717 | NA |
| Total ---------- do | [e] 4,900 | 4,842 | NA |
| Sand and gravel ---------- thousand metric tons | 25 | 23 | NA |
| Stone, crushed ---------- thousand cubic meters | 55 | 45 | NA |
| **BAHAMAS [2]** | | | |
| Cement, hydraulic ---------- thousand metric tons | 986 | 953 | 794 |
| Petroleum refinery products: | | | |
| Kerosine ---------- thousand 42-gallon barrels | -- | -- | 300 |
| Jet fuel ---------- do | 12,115 | 12,191 | 11,000 |
| Distillate fuel oil ---------- do | 11,200 | 19,126 | 11,200 |
| Residual fuel oil ---------- do | 45,713 | 53,582 | 45,500 |
| Other ---------- do | 11,419 | 14,879 | 12,000 |
| Refinery fuel and losses ---------- do | 1,354 | 4,563 | 2,000 |
| Total ---------- do | 81,801 | 104,341 | 82,000 |
| Salt ---------- thousand metric tons | 809 | 1,121 | 1,027 |
| Stone: | | | |
| Argonite ---------- do | NA | 917 | 1,483 |
| Limestone ---------- do | [r] 1,209 | 1,269 | 989 |
| **BARBADOS [2]** | | | |
| Gas, natural: | | | |
| Gross production [e] ---------- million cubic feet | [r] 140 | 140 | 140 |
| Marketed production ---------- do | [r] 127 | 127 | [e] 130 |
| Petroleum refinery products: | | | |
| Gasoline ---------- thousand 42-gallon barrels | 321 | 333 | 297 |
| Kerosine ---------- do | 95 | 77 | 62 |
| Distillate fuel oil ---------- do | 225 | 402 | 382 |
| Residual fuel oil ---------- do | 243 | 223 | 245 |
| Other ---------- do | 41 | 28 | 24 |
| Refinery fuel and losses ---------- do | 49 | 39 | 35 |
| Total ---------- do | 974 | 1,102 | 1,045 |
| **CUBA [2 3]** | | | |
| Cement, hydraulic ---------- thousand metric tons | 1,474 | [e] 1,500 | [e] 1,500 |
| Chromite [e] ---------- do | 20 | 20 | 20 |
| Cobalt [e] ---------- metric tons | 1,500 | 1,600 | 1,635 |
| Copper, mine output, metal content [e] ---------- do | 3,000 | 5,000 | 6,000 |
| Fertilizer, nitrogenous, manufactured ---------- thousand metric tons | 5 | 2 | 30 |
| Iron and steel, crude steel [e] ---------- do | 140 | 140 | 200 |
| Nickel: [e] | | | |
| Mine output (content of oxide and sulfide) ---------- metric tons | 32,000 | 32,000 | [e] 32,000 |
| Smelter [4 e] ---------- do | [r] 18,000 | 18,000 | 18,000 |
| Petroleum: | | | |
| Crude ---------- thousand 42-gallon barrels | 778 | 918 | 775 |
| Refinery products: | | | |
| Gasoline ---------- do | 6,826 | 7,744 | NA |
| Kerosine ---------- do | 3,426 | 3,503 | NA |
| Distillate fuel oil ---------- do | 5,304 | [e] 5,409 | NA |
| Residual fuel oil ---------- do | [r] 16,797 | 17,802 | NA |
| Lubricating oil ---------- do | [r] 728 | 833 | NA |
| Other: | | | |
| Liquefied petroleum gas ---------- do | [r] 771 | 771 | NA |
| Unspecified ---------- do | [r] 781 | 938 | NA |
| Total ---------- do | 34,633 | 37,000 | NA |
| Sulfur, elemental [e] ---------- thousand metric tons | 20 | 20 | 20 |
| **DOMINICA [e]** | | | |
| Pumice used for aggregate ---------- metric tons | 77,111 | 113,398 | [e] 114,000 |
| **DOMINICAN REPUBLIC [2]** | | | |
| Aluminum, bauxite, dry equivalent, gross weight [5] ---------- thousand metric tons | 1,035 | 1,145 | 1,210 |
| Cement, hydraulic ---------- do | 677 | 577 | 605 |
| Copper, mine output, metal content ---------- metric tons | 450 | 450 | 450 |
| Gypsum ---------- thousand metric tons | 248 | 229 | 230 |
| Nickel, content of ferronickel product ------- metric tons | 17,400 | 33,150 | 34,354 |

See footnotes at end of table.

## Table 1.—Islands of the Caribbean: Production of mineral commodities—Continued

| Area, commodity, and unit of measure [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **DOMINICAN REPUBLIC—Continued** | | | |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels [6] | -- | 1,945 | 2,372 |
| Kerosine and jet fuel ---- do | -- | 335 | 407 |
| Distillate fuel oil ---- do | -- | 1,074 | 1,879 |
| Residual fuel oil ---- do | -- | 1,443 | 1,629 |
| Other, liquefied petroleum gas ---- do | -- | 356 | 467 |
| Refinery fuel and losses ---- do | -- | 582 | 374 |
| Total ---- do | -- | 5,735 | 7,128 |
| Salt [e] ---- metric tons | 39,000 | 39,000 | 39,000 |
| Stone, limestone (excluding that for cement) [5] thousand metric tons | 52 | 118 | NA |
| **GUADELOUPE** | | | |
| Cement materials, pozzolona ---- do | NA | 160 | 175 |
| Clays ---- metric tons | NA | 1,000 | NA |
| Stone, sand and gravel: | | | |
| Stone crushed or broken ---- thousand metric tons | NA | 420 | 385 |
| Limestone ---- do | NA | 975 | 975 |
| Sand ---- do | NA | 238 | 255 |
| **HAITI [2 7]** | | | |
| Aluminum, bauxite, dried, gross weight ---- do | 687 | 648 | 649 |
| Cement, hydraulic ---- do | 81 | 108 | 142 |
| Clays ---- do | NA | NA | 43 |
| Stone, crushed, limestone ---- do | NA | 73 | 172 |
| **JAMAICA** | | | |
| Aluminum: | | | |
| Bauxite, dry equivalent of crude ore, gross weight | | | |
| Alumina (exports) ---- do | 12,543 | 13,600 | 15,328 |
| Cement, hydraulic ---- do | 2,136 | 2,416 | 2,805 |
| Clays for cement [e] ---- do | 417 | 403 | 399 |
| Gypsum ---- do | 150 | 140 | 140 |
| Lime ---- do | [8]441 | [8]357 | 269 |
| | 166 | 218 | 305 |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels | 2,345 | 2,155 | 1,717 |
| Kerosine ---- do | 528 | 735 | 533 |
| Jet fuel ---- do | 792 | 527 | 763 |
| Distilllate fuel oil ---- do | 2,062 | 1,981 | 1,770 |
| Residual fuel oil ---- do | 5,851 | 6,067 | 6,354 |
| Other: | | | |
| Liquefied petroleum gas ---- do | -- | 279 | 311 |
| Unspecified ---- do | 337 | 150 | 189 |
| Refinery fuel and losses ---- do | 596 | 181 | 354 |
| Total ---- do | 12,511 | 12,075 | 11,991 |
| Sand and gravel: | | | |
| Sand: | | | |
| Glass ---- thousand metric tons | 25 | 28 | 27 |
| Common ---- thousand cubic meters | 900 | NA | [e] 1,115 |
| Gravel ---- do | [e] 70 | NA | [e] 85 |
| Stone: | | | |
| Limestone ---- thousand metric tons | [e] 500 | [e] 520 | 30,351 |
| Marble ---- metric tons | NA | NA | -- |
| **MARTINIQUE** | | | |
| Clays ---- thousand metric tons | [e] 30 | 30 | [8]23 |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels | 272 | 951 | 1,718 |
| Kerosine ---- do | [e] 326 | 164 | 160 |
| Jet fuel ---- do | -- | 556 | -- |
| Distillate fuel oil ---- do | [e] 134 | 361 | 711 |
| Residual fuel oil ---- do | [e] 373 | 1,321 | 1,218 |
| Other, liquefied petroleum gas ---- do | 81 | 176 | 175 |
| Total ---- do | 1,186 | 3,529 | 3,977 |
| Pumice ---- thousand metric tons | [e] 18 | 151 | [8]110 |
| Salt [e] ---- do | 300 | 300 | 300 |
| Stone, sand and gravel: | | | |
| Stone, crushed and broken ---- do | [e] 650 | 932 | [8]292 |
| Sand ---- do | [e] 50 | 19 | 439 |
| **MONTSERRAT** | | | |
| Sand and gravel, natural ---- cubic meters | NA | 433,025 | NA |
| **NETHERLANDS ANTILLES [2]** | | | |
| Fertilizer materials: | | | |
| Phosphatic, crude phosphate rock - thousand metric tons | 111 | 92 | 107 |

See footnotes at end of table.

## Table 1.—Islands of the Caribbean: Production of mineral commodities—Continued

| Area, commodity, and unit of measure [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **NETHERLANDS ANTILLES—Continued** | | | |
| Fertilizer materials—Continued | | | |
| Nitrogenous, manufactured (sales) thousand metric tons | 112 | NA | 7 |
| Petroleum refinery products: | | | |
| Gasoline: | | | |
| Aviation thousand 42-gallon barrels | 4,438 | 548 | 2,524 |
| Motor do | 24,175 | 36,063 | 17,508 |
| Jet fuel do | 24,865 | 13,542 | 20,586 |
| Kerosine do | 15,403 | 12,848 | 1,420 |
| Distillate fuel oil do | 21,480 | 30,295 | 21,182 |
| Residual fuel oil do | 165,983 | 202,165 | 171,797 |
| Lubricants do | 6,234 | 3,212 | 3,743 |
| Other do | 7,863 | 30,995 | 26,484 |
| Refinery fuel and losses do | 10,363 | 9,154 | 16,354 |
| Total do | 280,804 | 338,822 | 281,598 |
| Sulfur, elemental metric tons | 74,000 | 72,000 | 110,000 |
| Salt [e] thousand metric tons | 200 | 480 | 480 |
| **ST. VINCENT** | | | |
| Sand metric tons | [e] 31,000 | NA | NA |
| Stone, crushed do | [e] 25,000 | NA | NA |
| **TRINIDAD AND TOBAGO** | | | |
| Asphalt, natural thousand metric tons | 115 | NA | 85 |
| Cement, hydraulic do | 287 | 263 | 242 |
| Clays: | | | |
| Argillite thousand cubic meters | NA | 155 | 253 |
| Other do | 96 | NA | 180 |
| Fertilizer materials, manufactured, nitrogenous thousand metric tons | 640 | 400 | 373 |
| Gas, natural: | | | |
| Gross production million cubic feet | [r] 104,338 | 113,500 | 127,686 |
| Marketed production do | [r] 67,084 | 64,384 | 58,239 |
| Natural gas liquids thousand 42-gallon barrels | 137 | 79 | -- |
| Petroleum: | | | |
| Crude do | 51,719 | 60,666 | 68,136 |
| Refinery products: | | | |
| Gasoline: | | | |
| Aviation do | 227 | 231 | 421 |
| Other do | 20,145 | 19,600 | 18,651 |
| Jet fuel do | 9,451 | 8,353 | 8,407 |
| Kerosine do | 6,766 | 7,757 | 6,065 |
| Distillate fuel oil do | 13,769 | 15,347 | 14,885 |
| Residual fuel oil do | 85,197 | 81,820 | 74,485 |
| Lubricants do | 1,241 | 942 | 1,207 |
| Other: | | | |
| Liquefied petroleum gas do | -- | 350 | 400 |
| Asphalt do | -- | -- | 76 |
| Unspecified do | 1,942 | 1,410 | 2,512 |
| Refinery fuel and losses do | 5,536 | 5,877 | 3,711 |
| Total do | 144,274 | 141,687 | 130,820 |
| Sand and gravel: | | | |
| Pitch sand thousand cubic meters | 24 | 26 | 63 |
| Other sand and gravel do | 664 | 109 | 502 |
| Stone: | | | |
| Diorite do | 2 | NA | 2 |
| Limestone do | 441 | 337 | [9] 1,217 |
| Porcellanite do | 9 | NA | 9 |
| Sulfur, elemental, byproduct metric tons | [e] 4,200 | [e] 4,000 | 26,206 |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the countries listed individually in this table, Bermuda, Grenada, and St. Lucia presumably produced crude construction materials (clays, sand, gravel, and stone) but output is not reported and available information is inadequate to make reliable estimates of output levels.

[2] In addition to the commodities listed, mineral commodity output may also include crude construction materials (clays, sand, gravel and lime) other than those listed, but data on such production are not collected and available information is inadequate to make reliable estimates of output levels.

[3] In addition, gypsum, iron ore, manganese ore, pyrite and salt, all produced in significant quantities prior to the termination of publication of official statistics, presumably were produced during the period covered by the table, but information is inadequate to formulate reliable estimates of output.

[4] Includes nickel content of nickel oxide and nickel fonte in addition to metallic nickel and ferronickel.

[5] Export figure, all production presumed to be exported.

[6] Erroneously reported as 42-gallon barrels in the previous edition.

[7] Presumably, salt is also produced, but output is not reported and information is inadequate to make reliable estimates of output levels.

[8] Data reported in cubic meters.

[9] Data reported in metric tons.

## Table 2.—Bahamas: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum metal including alloys, all forms | 1 | 2 |
| Copper metal including alloys, all forms | 2 | (1) |
| Iron and steel metal: | | |
| Scrap | 234 | 480 |
| Semimanufactures | 9 | 22 |
| Lead including alloys, all forms | 1 | 2 |
| Other: | | |
| Ore and concentrates of base metals, n.e.s | 203 | -- |
| Metals including alloys, all forms | 2,679 | 4,422 |
| **NONMETALS** | | |
| Cement thousand tons | 879 | 1,011 |
| Fertilizer materials | (1) | -- |
| Salt thousand tons | 908 | 335 |
| Stone, sand and gravel: | | |
| Dimension stone, worked value | -- | $800 |
| Sand | -- | 1 |
| Other nonmetals, n.e.s | -- | 460 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Petroleum: | | |
| Crude and partly refined thousand 42-gallon barrels | 2,047 | 24,630 |
| Refinery products: | | |
| Gasoline: | | |
| Motor do | 3,985 | 12,046 |
| Aviation do | 8 | 7 |
| Kerosine do | 150 | 153 |
| Jet fuel do | 1,895 | 7,276 |
| Distillate fuel oil do | 4,663 | 10,541 |
| Residual fuel oil do | 3,334 | 51,047 |
| Lubricants do | (1) | (1) |
| Other, liquefied petroleum gas do | (1) | (1) |

[1] Less than ½ unit.

## Table 3.—Bahamas: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum metal including alloys: | | |
| Unwrought | 5 | 15 |
| Semimanufactures | 171 | 251 |
| Copper including alloys, all forms | 30 | 27 |
| Iron and steel: | | |
| Ore and concentrate | -- | 28,033 |
| Metal: | | |
| Scrap | 4 | 21,196 |
| Pig iron | -- | (1) |
| Steel, primary forms | 147 | 23 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections | 7,147 | 4,759 |
| Universals, plates, sheets | r 8,293 | 13 |
| Hoop and strip | 66 | 8 |
| Rails and accessories | 11 | 138 |
| Wire | 1,664 | 51 |
| Tubes, pipes, and fittings | 14,440 | 10,380 |
| Castings and forgings, rough | 1,522 | 2,608 |
| Lead metal including alloys, all forms | 9 | 6 |
| Nickel metal including alloys, all forms | -- | (1) |
| Platinum-group metals and silver troy ounces | 3,500 | -- |
| Tin including alloys, all forms long tons | 938 | 1,531 |
| Uranium and thorium, including alloys, all forms | (1) | -- |
| Zinc metal including alloys, all forms | 1 | 8 |
| Other, nonferrous base metals including alloys, all forms | 5 | 9 |
| **NONMETALS** | | |
| Abrasives, natural, n.e.s | 24 | 37 |
| Cement | 69,868 | 135,684 |
| Clays and clay products (including all refractory brick) | 327 | 758 |
| Diamond, gem, not set or strung value | $892 | -- |

See footnotes at end of table.

Table 3.—Bahamas: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials: | | | |
| Crude | | 1,857 | 1,090 |
| Manufactured | | r 2,446 | 3,352 |
| Ammonia | | (2) | -- |
| Lime | | 278 | 363 |
| Precious and semiprecious stones, except diamond | value | $774 | -- |
| Salt | | 24,283 | 13,372 |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | thousand tons | 148 | 249 |
| Worked | value | $96,782 | $77,157 |
| Gravel and crushed rock | | 72,243 | 20,713 |
| Limestone | | 4 | -- |
| Sand | thousand tons | 125 | 176 |
| Sulfur | | -- | (1) |
| Other crude nonmetals, n.e.s | | r 1,476 | 1,679 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | | 186 | 316 |
| Coal | | 13 | 16 |
| Coke and briquets | | 160 | 5,986 |
| Petroleum: | | | |
| Crude and partly refined | thousand 42-gallon barrels | 11,893 | 104,341 |
| Refinery products: | | | |
| Gasoline: | | | |
| Motor | do | 511 | 787 |
| Aviation | do | 50 | 114 |
| Kerosine, including white spirit | do | 129 | 733 |
| Jet fuel | do | r 1 | 42 |
| Distillate fuel oil | do | 492 | 840 |
| Residual fuel oil | do | 3,768 | 3,732 |
| Lubricants | do | 19 | 30 |
| Other: | | | |
| Liquefied petroleum gas | do | r 49 | 174 |
| Mineral jelly and wax | do | (1) | (1) |
| Pitch | do | r 1 | (1) |
| Bituminous mixtures, n.e.s | value | $53,531 | $67,190 |
| Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals | do | $26,962 | $30,298 |

r Revised.
1 Less than ½ unit.
2 Revised to none.

## BARBADOS [2]

The concession agreement between the Barbados Government and the U.S. firm, General Crude Oil Co. of Houston, Tex., has been renewed until July 1976. During 1974, six operating wells produced about 400 barrels per day of high-quality, almost sulfurless crude oil; the oil was sold to the island's only refinery, owned by Mobil Oil Barbados, Ltd. General Crude estimates it will be producing 1,000 barrels per day by mid-1975. The one producing natural gas well is capable of supplying 200,000 cubic feet per day, or about 57% of local requirements, and prospects for other wells are excellent. General Crude plans to conduct an active exploration program.

The Mobil Oil refinery processed approximately 3,000 barrels per day of petroleum, which was supplied by Venezuela, along with the small amount produced locally. The production of mineral commodities in Barbados is shown in table 1.

[2] Prepared by Fay B. Dillard.

## Table 4.—Barbados: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum metal including alloys: | | |
| Scrap | -- | 3 |
| Unwrought and semimanufactures | 36 | 20 |
| Copper: | | |
| Ore and concentrate | -- | 10 |
| Metal including alloys: | | |
| Scrap | -- | 90 |
| Unwrought and semimanufactures | 4 | (1) |
| Iron and steel metal: | | |
| Scrap | 49 | 10 |
| Pig iron, ferroalloys, and similar materials | 61 | -- |
| Steel, primary forms | 1 | (1) |
| Semimanufactures | 310 | 579 |
| Lead: | | |
| Ore and concentrate | -- | 6 |
| Oxides | -- | 17 |
| Metal including alloys: | | |
| Scrap | -- | 68 |
| Unwrought and semimanufactures | 3 | 46 |
| Platinum-group metals, other ores | -- | 50 |
| Zinc metal including alloys, unwrought and semimanufactures | -- | (1) |
| Other: | | |
| Ore and concentrate of base metals, n.e.s | -- | 21 |
| Nonferrous metal scrap, n.e.s | 481 | 247 |
| Oxides, hydroxides and peroxides of metals, n.e.s | -- | 2 |
| **NONMETALS** | | |
| Cement | 8 | 111 |
| Clays and clay products, including refractory brick: | | |
| Crude clays, n.e.s | (1) | 46 |
| Products: | | |
| Refractory, including nonclay brick | (1) | 20 |
| Nonrefractory | 544 | 2413 |
| Diatomite and other infusorial earth | (1) | (1) |
| Fertilizer materials: | | |
| Manufactured | 3 | 7 |
| Ammonia | | 1 |
| Gypsum and plasters | -- | 1 |
| Lime | 7,210 | 7,562 |
| Mica, worked, including agglomerated splittings | -- | 1 |
| Salt | 3 | 55 |
| Sodium and potassium compounds, n.e.s | 1 | 24 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude | 34 | 1 |
| Worked | 95 | 3 |
| Gravel and crushed stone | 159 | 8,900 |
| Sand, excluding metal bearing | -- | 142 |
| Sulfuric acid | (1) | 1 |
| Other crude nonmetals, n.e.s | 2 | 4,083 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Coal, all grades, excluding briquets | 22 | 4 |
| Peat, including peat briquets and litter | 1 | 1 |
| Petroleum refinery products: | | |
| Gasoline, thousand 42-gallon barrels | 7 | 9 |
| Kerosine, do | 81 | 39 |
| Jet fuel, do | 446 | 533 |
| Distillate fuel oil, do | 396 | 238 |
| Residual fuel oil, do | 527 | 258 |
| Lubricants, do | 1 | 1 |
| Other, do | 4 | 3 |
| Total, do | 1,462 | 1,081 |

[1] Less than ½ unit.

[2] Partial figure. Excludes quantity valued at $1,849.

## Table 5.—Barbados: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum: | | |
| Oxide and hydroxide | -- | 1 |
| Metal including alloys, unwrought and semimanufactures | 293 | 498 |
| Cobalt oxide and hydroxide | 1 | -- |
| Copper metal including alloys, unwrought and semimanufactures | 47 | 85 |
| Iron and steel metal: | | |
| Scrap | 89 | 117 |
| Pig iron, ferroalloys, and similar materials | 17 | 148 |
| Steel, primary forms | 67 | 27 |
| Semimanufactures | 13,192 | 14,895 |
| Lead: | | |
| Oxides | 12 | 120 |
| Metal including alloys: | | |
| Scrap | -- | 5 |
| Unwrought and semimanufactures | 70 | 59 |
| Mercury 76-pound flasks | (1) | -- |
| Nickel metal including alloys, unwrought and semimanufactures | (1) | 1 |
| Platinum-group metals: | | |
| Other ores troy ounces | -- | 7 |
| Metals including alloys do | -- | 276 |
| Silver metal including alloys | 6,769 | 403 |
| Tin metal including alloys, unwrought and semimanufactures long tons | 439 | 169 |
| Titanium oxides | 174 | 95 |
| Zinc: | | |
| Oxide | 33 | 6 |
| Metal including alloys, unwrought and semimanufactures | 37 | 46 |
| Other: | | |
| Scrap, nonferrous metals, n.e.s | 11 | 4 |
| Oxides, hydroxides, peroxides of metals, n.e.s | -- | 101 |
| Base metals including alloys, all forms, n.e.s | (1) | 1 |
| **NONMETALS** | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | (1) | 1 |
| Grinding and polishing wheels and stones | 4 | 2 |
| Asbestos | (1) | 5 |
| Cement | 55,856 | 49,648 |
| Chalk | 3 | 1 |
| Clays and clay products, including all refractory brick: | | |
| Crude clays, n.e.s | 26 | 20 |
| Products: | | |
| Refractory, including nonclay brick | 157 | r277 |
| Nonrefractory | 656 | r722 |
| Diatomite and other infusorial earth | 34 | 35 |
| Fertilizer materials: | | |
| Manufactured: | | |
| Nitrogenous | 3,474 | 2,454 |
| Phosphatic | 39 | 10 |
| Potassic | 3 | 81 |
| Other, including mixed | 12,207 | 12,798 |
| Ammonia | 22 | 20 |
| Graphite, natural | -- | (1) |
| Gypsum and plasters | -- | 8 |
| Lime | 190 | 1,026 |
| Mica, all forms | (1) | 20 |
| Pigments, mineral: | | |
| Natural, crude | -- | 1 |
| Iron oxides, processed | 18 | 2 |
| Precious and semiprecious stones, except diamond, natural kilograms | -- | 607 |
| Salt | 2,215 | 1,975 |
| Sodium and potassium compounds, n.e.s.: | | |
| Caustic soda | 202 | 163 |
| Caustic potash, sodic and potassic peroxides | (1) | 10 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude and partly worked | 20 | 44 |
| Worked | 51 | 11 |
| Gravel and crushed rock | 198 | 200 |
| Sand, excluding metal bearing | 6 | 220 |
| Sulfur: | | |
| Sulfur dioxide | -- | 1 |
| Sulfuric acid, oleum | 75 | 93 |
| Talc, steatite, soapstone, pyrophyllite | -- | 5 |

See footnotes at end of table.

Table 5.—Barbados: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Other nonmetals, n.e.s.: | | | |
| Crude | | 138 | 91 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | | 1,188 | 777 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | | 74 | 45 |
| Coal, all grades, including briquets | | 125 | 96 |
| Coke and semicoke | | 72 | 25 |
| Hydrogen, helium and rare gases | | 1 | 5 |
| Peat, including peat briquets and litter | | 9 | 56 |
| Petroleum: | | | |
| Crude | thousand 42-gallon barrels | 691 | 922 |
| Refinery products: | | | |
| Gasoline | do | 144 | 177 |
| Kerosine | do | 80 | 44 |
| Jet fuel | do | 482 | 506 |
| Distillate fuel oil | do | 231 | 221 |
| Residual fuel oil | do | 298 | 331 |
| Lubricants | do | 12 | 15 |
| Other: | | | |
| Liquefied petroleum gas | do | 90 | 82 |
| Other | do | 3 | 2 |
| Total | do | 1,340 | 1,378 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | 23 | 7 |

[1] Less than ½ unit.
[2] Partial figure. Excludes quantity valued at $5,633.
[3] Partial figure. Excludes quantity valued at $92,092.

## BERMUDA [3]

A decline in the construction industry in 1974 led to decreased output of construction aggregates, the principal products of the small mining industry in Bermuda. As in past years, mineral production in Bermuda in 1974 consisted of small quantities of sand, dimension limestone, and crushed limestone. Production of crushed limestone totaled about 50,000 tons in 1974. The great bulk of the output was used as aggregate in asphalt mixes; the remainder was used in paving and concrete construction units such as blocks and curbing. Imports consisted principally of petroleum refinery products, precious metals, and construction aggregates.

## CUBA [4]

Estimates of Cuban mineral production are shown in table 1. Detailed information on the Cuban mineral industry is not available, and the following items are from the few published accounts.

An economic pact with the U.S.S.R., signed at yearend 1972, provided for tripling Cuban nickel capacity by the mid-1980's. Cuba also had trade agreements with other centrally planned economy countries that call for increased imports of Cuban nickel, copper, and chrome ores.

### COMMODITY REVIEW

**Metals.**—*Chromite.*—Output in 1974 was estimated at about 20,000 tons. The mines are located in the Moa-Baracoa area in Oriente Province.

*Cobalt.*—Production in 1974 stayed at about the 1973 level of 1,600 tons. The cobalt was produced in sulfide form as a byproduct of nickel production.

[3] Prepared by Harold J. Drake, physical scientist, Division of Nonferrous Metals.
[4] Prepared by William C. Butterman, physical scientist, Division of Nonferrous Metals.

*Copper.*—Production in 1974, estimated at 6,000 tons, came from the Capitan Alberto Fernandez mine (formerly the Matahambre mine) in Pinar del Rio Province.

*Nickel.*—Production in 1974 is believed to have been at about the 1973 level of 32,000 tons. Cuba remained the world's fourth-largest source of nickel. The economic agreements signed with the U.S.S.R. in 1972 called for Cuban nickel output to roughly triple. A new 30,000-ton-per-year plant at Punta Gorda in Oriente Province was to be operational in late 1973, the plants at Moa Bay and Nicaro were to be modernized, and Nicaro's capacity was to be expanded. Expansion of the nickel industry will be furthered by a Soviet agreement to purchase Cuban output through 1980 at a fixed price of $2.27 per pound, and by a trade agreement with Spain that calls for increased imports of Cuban nickel.

**Nonmetals.**—*Cement.*—Production in 1974 was estimated at 1.5 million tons. Cuban cement capacity was estimated at 2.4 million tons in 1972, after completion of two new plants with a combined capacity of nearly 1.1 million tons per year.

**Table 6.—Cuba: Selected mineral commodity imports from U.S.S.R.[1]**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum metal including alloys, all forms | 5,680 | 5,700 |
| Copper metal including alloys, all forms | 5,683 | 5,681 |
| Iron and steel: | | |
| Scrap | 51,600 | 56,517 |
| Pig iron | 89,100 | 107,535 |
| Ferroalloys | 3,300 | 3,385 |
| Steel semimanufactures | r 216,600 | 230,000 |
| Lead metal including alloys, all forms | 1,212 | 1,200 |
| Zinc metal including alloys, all forms | 500 | 501 |
| NONMETALS | | |
| Abrasives, hard alloys | (2) | (2) |
| Asbestos | 12,300 | 11,980 |
| Cement, hydraulic | 52,000 | 47,000 |
| Fertilizer materials: | | |
| Nitrogenous: | | |
| Urea | 74,500 | 60,140 |
| Other manufactured | 290,900 | 255,500 |
| Phosphatic | 126,200 | 139,136 |
| Potassic | 128,900 | 127,019 |
| Refractory materials | 16,500 | 23,138 |
| Sodium compounds, n.e.s.: | | |
| Caustic soda | 27,800 | 23,599 |
| Soda ash | 12,400 | 10,061 |
| Sulfur | 132,900 | 143,573 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Carbon black | 2,635 | 4,060 |
| Coal: | | |
| Anthracite thousand tons | 34 | 44 |
| Bituminous do | 22 | 18 |
| Coke do | 57 | 54 |
| Petroleum, crude oil and refinery products do | 7,025 | 7,435 |

[1] Soviet exports to Cuba, reported in: Vneshnyaya Torgoviya S.S.S.R. za 1973 god (Foreign Trade of the U.S.S.R. for 1973). Moscow, 1974.
[2] Less than ½ unit.

## DOMINICAN REPUBLIC [5]

Production of bauxite by the Aluminum Company of America (Alcoa) in Barahona Province was 1,210,000 tons in 1974. Bauxite shipments to the United States totaled 1,303,588 tons. The Government of the Dominican Republic and Alcoa reached an accord at yearend that reportedly would more than double the revenues paid to the Government on bauxite production. Retroactive to April 1, 1974, Alcoa would pay a royalty on bauxite production based on a rate of 5.5% of the average price obtained by Alcoa on sales of primary aluminum metal. The agreement also in-

[5] Prepared by E. Chin, physical scientist, Division of Nonferrous Metals.

cluded revisions in the method of calculating earnings on taxable income. Under the terms of the agreement, the royalties paid on bauxite production would be provisional until Alcoa's dispute on the terms of bauxite production taxation in Jamaica have been settled.

The ferronickel operation of Falconbridge Dominicana C. por A. (Falcondo) operated at or near its design capacity of 63 million pounds per year of nickel in ferronickel. Higher production costs from increased oil prices were partially offset by operational economies and plant modifications. Shipments of ferronickel by Falcondo were expected to contribute more than $60 million per year to the gross foreign exchange revenue of the Republic.

Construction and equipment installation for the Pueblo Viejo gold and silver mining complex of Rosario Dominicana S.A. (Rosario) was essentially completed by yearend. Initial shipments of gold and silver were expected in early 1975. In June 1974, the parent companies, Rosario Resources Corp. and Simplot Industries, Inc., entered into an agreement with the Central Bank of the Dominican Republic whereby the state acquired 20% participation in Rosario. Total investment in the complex was estimated to be in excess of $30 million, the loan portion of which is a combination of finance from Dominican Republic and U.S. banks.

Reserves of oxide ore were estimated at 30 million tons containing 0.128 troy ounce of gold and 0.82 troy ounce of silver per ton. A sulfide deposit underlying the oxide ore has been identified; drilling has proved 17.7 million tons of ore grading 2.19% zinc, 0.252% copper, and 0.131 troy ounce of gold and 1.12 troy ounce of silver per ton. The cyanidation plant, which has a capacity of 8,000 tons per day of ore, will process only the oxide ore in the initial stage of development. When the mine is in full production, which was expected in late 1975, it is scheduled to produce 350,000 troy ounces of gold and 1.5 million troy ounces of silver per year. At this capacity, the Pueblo Viejo mine will be the largest open pit gold producer in the Western Hemisphere.

Cementos Nacionales, S.A., will build a cement plant near the port of San Pedro de Macoris, about 43 miles east of Santa Domingo. The dry process plant, which will have a production capacity of 510,000 tons per year, was scheduled for completion by September 1975. Loan capital from the Export-Import Bank, the Chemical Bank, and the Chase Manhattan Bank will total $20.2 million. In addition, the International Finance Corp. will loan $7.38 million, and an additional $14 million will be financed by Dominican sources.

**Table 7.—Dominican Republic: Exports of mineral commodities [1]**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: Bauxite ore and concentrate, gross weight | 1,227,053 | 1,415,849 | All to United States. |
| Copper metal, scrap | 529 | 519 | Do. |
| Iron and steel, ferronickel | 41,668 | 76,175 | NA. |
| Nickel metal, scrap | -- | 129 | All to France. |
| NONMETALS | | | |
| Gypsum and plasters value, thousands | $371 | $648 | All to United States. |

NA Not available.

[1] Source: For bauxite and ferronickel—Banco Central de la Republica Dominicana, Boletin Mensual. V. 28, Nos. 7-9, July-September 1975; for all other commodities—import statistics of selected partner countries.

Table 8.—Dominican Republic: Apparent imports of mineral commodities [1]
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum metal, unwrought and semimanufactures | | 2,290 | 2,098 |
| Copper metal, unwrought and semimanufactures | | 1,281 | 1,129 |
| Iron and steel: | | | |
| Pig iron and ferroalloys | | 268 | 1,231 |
| Steel ingots and equivalent primary forms | | 3,529 | 7,885 |
| Semimanufactures | | 59,197 | 68,044 |
| Lead metal, unwrought and semimanufactures | | 48 | 176 |
| Zinc metal, unwrought and semimanufactures | | -- | 339 |
| **NONMETALS** | | | |
| Abrasives, natural, grinding wheels and stones | value, thousands | -- | $160 |
| Asbestos | | 2,260 | 693 |
| Cement, hydraulic | | 86,322 | 19,907 |
| Clays and clay products: | | | |
| Crude clays | | -- | 855 |
| Clay products: | | | |
| Nonrefractory | value, thousands | $437 | $79 |
| Refractory | do | $999 | $1,432 |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous | | 75,411 | 125,532 |
| Phosphatic | | 11,417 | 12,850 |
| Potassic | | 11,124 | 36,905 |
| Mixed | | 13,135 | 28,855 |
| Magnesite | value, thousands | -- | $73 |
| Stone, sand and gravel: | | | |
| Dimension stone, worked | | -- | 363 |
| Gravel and crushed stone | | -- | 491 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Petroleum refinery products: | | | |
| Gasoline | thousand 42-gallon barrels | 2,203 | 117 |
| Jet fuel | do | 279 | 10 |
| Kerosine | do | 145 | -- |
| Distillate fuel oil | do | 1,143 | -- |
| Residual fuel oil | do | 3,511 | 2,042 |
| Lubricants | do | 155 | 164 |
| Other | do | 2,998 | 335 |
| Total | do | 10,434 | 2,668 |

[1] Source: Petroleum data—U.S. Bureau of Mines. International Petroleum Annual, 1973, March 1975, 31 pp; all other figures—official trade returns of selected trading partner countries.

## HAITI [6]

The bauxite mining operation of Reynolds Haitian Mines S.A. was the only important mineral activity in Haiti. In 1974, production of bauxite by Reynolds was estimated to be 649,000 tons. Bauxite shipments to the U.S. were 598,452 tons. In early December, the Government of Haiti, and Reynolds reached an agreement on a basis for computing a severance tax on bauxite shipments for 1974. The rate per long dry ton of bauxite was slightly less than 0.0146% of the average realized price per short ton of primary aluminum ingot. According to reports, a royalty of 50 cents per ton of bauxite was also applicable. Payment of the severance tax and the royalty for bauxite shipments during the first three quarters of the year were due on December 22 to the Administration Generale des Contribution. The payment for fourth-quarter shipments was due on January 15, 1975. Further negotiations were expected in 1975 to establish final agreement on bauxite tax rates.

The Government of Haiti has proposed the establishment of an independent agency to coordinate mineral activities. The new agency will be charged with formulating a national policy for the improvement and utilization of the country's mineral and energy resources.

[6] Prepared by E. Chin.

## Table 9.—Haiti: Exports of mineral commodities [1]

(Metric tons)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| Aluminum, bauxite | r 770,438 | 790,457 | All to United States. |
| Cement | 907 | -- | |
| Copper, ore and concentrate | 1,400 | -- | |
| Metal, unspecified | 42 | 17 | West Germany 15. |

r Revised.
[1] Years ended September 30 of those stated.

## Table 10.—Haiti: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal, all forms | 320 | 368 | Austria 142; United States 142. |
| Copper metal, all forms | 18 | 12 | United States 4; United Kingdom 3. |
| Iron and steel: | | | |
| Scrap | 20 | 2 | All from United States. |
| Semimanufactures [2] | 12,360 | 19,229 | Belgium-Luxembourg 9,009; France 4,872. |
| Lead metal, all forms | 1 | 1 | All from United States. |
| Nickel metal kilograms | 89 | 1 | Mainly from United Kingdom. |
| Platinum-group metals troy ounces | 64 | 32 | All from United States. |
| Silver metal do | 643 | 64 | Do. |
| Tin metal, all forms long tons | 377 | 386 | Mainly from United States. |
| Zinc | 1 | (3) | All from United States. |
| Other: | | | |
| Base metal n.e.s | 456 | -- | |
| Scrap of nonferrous metals n..e.s | 20 | -- | |
| NONMETALS | | | |
| Abrasives, natural grinding and polishing wheels and stones kilograms | 1,615 | 97 | Japan 30; West Germany 30; Australia 20. |
| Cement | 620 | 854 | Denmark 610; France 127; Belgium-Luxembourg 55. |
| Clays: | | | |
| Crude | 129 | 98 | Mexico 42; United States 41. |
| Manufactured products | 376 | 569 | United States 224; France 138. |
| Diamond, industrial [4] kilograms | 451 | -- | |
| Fertilizers: | | | |
| Crude: | | | |
| Phosphatic | 37 | 2 | Mainly from Netherlands. |
| Potassic | 17 | 5 | All from West Germany. |
| Manufactured, nitrogenous | 249 | 120 | All from Dominican Republic. |
| Graphite, natural kilograms | 607 | -- | |
| Mica, worked and unworked, including splittings and waste | 6 | 7 | All from United States. |
| Pigments, mineral, natural | 73 | 93 | West Germany 27; United States 23; Japan 15. |
| Precious and semiprecious stones, except diamond, including synthetics value | $10,280 | -- | |
| Salt | 108 | 85 | United States 73; Canada 9. |
| Stone, sand and gravel: | | | |
| Sand and gravel, including crushed quartz | 7 | 150 | United States 134; Netherlands 14. |
| Stone: | | | |
| Dimension, worked and partly worked | 8 | 4 | Mainly from United States. |
| Industrial, except dimension | 21 | 34 | West Germany 17; United States 11. |
| Limestone | 57 | 8 | All from United States. |
| Other: | | | |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 389 | 386 | Belgium-Luxembourg 373. |
| Nonmetallic minerals, worked and unworked, n.e.s | 137 | 134 | All from United States. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt, natural | 290 | | |
| Coal, coke, agglomerates | 1 | 24 | United States 14; Belgium-Luxembourg 10. |

See footnotes at end of table.

Table 10.—Haiti: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum refinery products: | | | |
| Gasoline thousand 42-gallon barrels | 72 | 80 | Netherlands Antilles 73; United States 5. |
| Kerosine do | 12 | 9 | Netherlands Antilles 7. |
| Distillate fuel oil do | 517 | 428 | Netherlands Antilles 380; Venezuela 21. |
| Lubricants do | 15 | 13 | United States 5; Netherlands Antilles 4. |
| Other: | | | |
| Liquefied petroleum gas do | 12 | 12 | Panama 9; Spain 2. |
| Mineral waxes do | 2 | 3 | West Germany 1; United States 1. |
| Bituminous mixtures, ne.s do | (3) | (3) | Mainly from United States. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 2 | 9 | United Kingdom 8; United States 1. |

[1] Years ended September 30 of those stated.
[2] Includes small quantities of pig iron, ferroalloys and crude steel.
[3] Less than ½ unit.
[4] May include a substantial portion of stone other than diamond.

## JAMAICA [7]

In 1974, Jamaica was the second-largest bauxite-producing country in the world and the third-largest producer of alumina, the intermediate product in the production of aluminum from bauxite. Alumina and bauxite together accounted for 72% of the total value of all Jamaican exports.

Bauxite and alumina were produced by subsidiaries of six aluminum companies based in the U.S. and Canada. During 1974, bauxite exports increased 8% and alumina exports increased 19%. Bauxite was exported by Kaiser Bauxite Co., Reynolds Jamaica Mines, Ltd., and Alcoa Minerals of Jamaica, Inc. The producers of alumina in Jamaica were as follows:

| Company and plant location | Yearend capacity (thousand metric tons) | Ownership |
|---|---|---|
| Alcan Jamaica, Ltd.: | | Alcan Aluminium Ltd. 100%. |
| Ewarton, St. Catherine | 566 | |
| Kirkvine, Manchester | 558 | |
| Alcoa Minerals of Jamaica, Inc.: | | Aluminum Co. of America 100%. |
| Woodside, Clarendon | 500 | |
| Alumina Partners of Jamaica, Ltd.: | | Reynolds Metals Co. 36.8%, Anaconda Aluminum Co. 36.8%, and Kaiser Aluminum & Chemical Corp. 26.4%. |
| Nain, St. Elizabeth | 1,179 | |
| Revere Jamaica Alumina, Ltd.: | | Revere Copper & Brass, Inc. 100%. |
| Maggotty, St. Elizabeth | 200 | |
| Total | 3,003 | |

The Government of Jamaica was one of seven governments that participated in the organization of the International Bauxite Association (IBA) in 1974. The announced objectives of the member countries of IBA included securing equitable returns from the exploitation of their bauxite resources and effective national control over their bauxite industries. Headquarters for the new organization was established in Kingston, Jamaica.

Early in 1974, the Government of Jamaica requested discussions with the bauxite producers on increasing its revenues from bauxite production and its control and participation in the development of Jamaican bauxite resources. Representatives of the Government and the producers held a series of meetings but were unsuccessful in renegotiating existing bauxite tax agreements.

In June, the Jamaican Government en-

[7] Prepared by Horace F. Kurtz, industry economist, Division of Nonferrous Metals.

acted legislation imposing a new bauxite-production levy, retroactive to January 1, 1974. The new levy was based on a percentage of the realized price on primary aluminum. The applicable rate was set initally at 7.5% and was scheduled to increase to 8.0% on April 1, 1975, and 8.5% on April 1, 1976. Estimates of the levy to be applied in 1974 ranged from $11 to $14 per ton, depending on the assumed price of aluminum. In addition to the levy, the royalty on bauxite production was increased to $0.55 per ton. Jamaican taxes and royalties in 1973 reportedly averaged about $2 per ton. The new bauxite legislation also specified minimum production levels for each producer.

The producers made quarterly payments on the required new levies under protest, claiming violation of previous agreements on taxation. Three of the companies filed requests for arbitration with the World Bank's International Center for Settlement of Investment Disputes (ICSID). The Jamaican Government asserted that ICSID had no jurisdiction in these disputes.

In the last quarter of 1974, the Government began company-by-company negotiations to acquire equity participation in bauxite mining, ownership of bauxite lands, and control of mining rights. An agreement was reached with Kaiser whereby Kaiser would sell the Government its bauxite lands (40,000 acres) and a 51% interest in its mining assets at book value. The Government agreed to provide a 40-year reserve of bauxite at the current rate of extraction under a land-leasing arrangement and to adjust the bauxite levy by keeping it at 7.5% for 3 years and at 1% less than the national levy for two additional years.

By yearend, a preliminary agreement had also been reached with Revere Jamaica Alumina, Ltd., that provided for the purchase of Revere's bauxite lands by Jamaica, a lease back of reserves, and a government and Revere mining partnership. The Government may also participate with six Japanese companies in a proposed expansion of Revere's Maggotty alumina plant. Feasibility studies were in progress.

The Governments of Jamaica and Mexico agreed to establish an integrated bauxite, alumina, and aluminum complex as a joint venture. Announced plans include a bauxite mine to produce at least 1.3 million tons per year, a caustic soda plant, and an alumina plant of 600,000 tons to 800,000 tons per year capacity, all of which will be located in Jamaica. In addition, an aluminum smelter of 120,000 tons per year capacity is to be built in Mexico.

Another bauxite-to-aluminum joint venture being studied involved Jamaica, Guyana, and Trinidad and Tobago. Bauxite and alumina would be supplied by Jamaica and Guyana and a smelter, which would use natural gas from Trinidad for power would be constructed at Point Lisas, Trinidad.

Construction of a plant to produce 18,000 tons per year of galvanized steel sheet was completed during 1974. The plant is a joint venture of Industrial Commercial Development Ltd. of Jamaica (65%) and three Japanese firms (35%), which have formed G.I. Industries Ltd. to operate the plant.

Limestone, Jamaica's most abundant mineral raw material, was quarried throughout the island for use as an aggregate in construction and was used in making cement and lime. Cement production declined slightly during the year to 399,000 tons. Lime production, mainly for use in making alumina, increased sharply to about 305,000 tons. Gypsum production, most of which was exported, declined to 269,000.

Esso West Indies, Ltd., operated the only petroleum refinery in Jamaica. The plant, located at Kingston, used imported crude oil.

## Table 11.—Jamaica: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite and concentrate thousand tons | 7,162 | 7,390 | All to United States. |
| Alumina do | 2,136 | 2,381 | United States 732; Norway 657; United Kingdom 341. |
| Metal including alloys: | | | |
| Scrap | (1) | 59,289 | Mainly to United States. |
| Unwrought and semimanufactures | 1,030 | 1,004 | Haiti 339; Trinidad and Tobago 181; Barbados 174. |
| Copper metal including alloys: | | | |
| Scrap | (1) | 394,223 | Mainly to West Germany. |
| Unwrought and semimanufactures | 87 | (2) | |
| Iron and steel metal: | | | |
| Scrap | -- | 147 | Mainly to United States. |
| Semimanufactures | 42,039 | 3571 | Mainly to Trinidad and Tobago. |
| Lead: | | | |
| Ore and concentrate value | -- | $1,584 | All to Dominican Republic. |
| Metal including alloys: | | | |
| Scrap | (1) | 109 | Netherlands 63; Brazil 44. |
| Unwrought and semimanufactures | 122 | 395 | Dominican Republic 154; United Kingdom 126; Brazil 64. |
| Magnesium metal and alloys, unwrought and semimanufactures | -- | 125 | Japan 106; Dominican Republic 18. |
| Nickel metal and alloys, unwrought and semimanufactures | -- | 3 | All to Canada. |
| Platinum-group metals and alloys, unwrought and semimanufactures value, thousands | -- | $2 | Do. |
| Silver metal and alloys, unwrought and semimanufactures troy ounces | -- | 315 | All to United States. |
| Tin metal including alloys: | | | |
| Scrap long tons | (1) | 31,842 | Mainly to United States. |
| Unwrought and semimanufactures do | (4) | 19 | Do. |
| Zinc metal and alloys, unwrought and semimanufactures | 20 | 14 | Mainly to Turks and Caicos Islands. |
| Other: | | | |
| Oxides, peroxides and hydroxides of metals, n.e.s | -- | (4) | All to United States. |
| Metals including alloys, unwrought and semimanufactures | 43 | 138 | West Germany 79; Guyana 23. |
| **NONMETALS** | | | |
| Abrasives, grinding and polishing wheels and stones | (4) | (4) | All to Cayman Islands. |
| Cement, hydraulic | 2,455 | 2,968 | Cayman Islands 1,169; Barbados 1,143. |
| Chalk | -- | 84 | All to Antigua. |
| Clays and clay products: | | | |
| Crude | -- | 1 | All to Guyana. |
| Clay products: | | | |
| Nonrefractory | -- | 1 | All to Belize. |
| Refractory | -- | 98 | Mainly to Cayman Islands. |
| Fertilizer materials, manufactured, including ammonia | 225 | 304 | United States 149; Trinidad and Tobago 64. |
| Gypsum and plasters | -- | 327,351 | Mainly to United States. |
| Lime | 1,034 | 2,323 | Mainly to Barbados. |
| Mica, crude and manufactured | 59 | 155 | All to United States. |
| Pyrite (gross weight) | -- | 254 | All to Cayman Islands. |
| Salt | 796 | 198,226 | Haiti 151,211; Guyana 27,440. |
| Stone, sand and gravel: | | | |
| Dimension stone, crude and worked | (4) | 14 | Mainly to Cayman Islands. |
| Gravel and crushed stone | (4) | (4) | All to United States and Italy. |
| Industrial, n.e.s | 417,566 | -- | |
| Limestone (except dimension) | -- | 3 | All to United States. |
| Sand, excluding metal bearing value | -- | $133 | All to Trinidad and Tobago. |
| Sodium carbonate | -- | 3 | All to Guyana. |
| Sulfur, sulfuric acid | 577 | (4) | All to Cayman Islands. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 50 | -- | |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | -- | 229 | Guyana 128; Dominican Republic 98. |

See footnotes at end of table.

## Table 11.—Jamaica: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | -- | 55,080 | Mainly to Cayman Islands. |
| Carbon, gas | -- | 3,050 | Mainly to Barbados. |
| Coke and semicoke value | -- | $13 | All to Cayman Islands. |
| Petroleum: | | | |
| Crude oil | | | |
| thousand 42-gallon barrels | 29 | 177 | Bahamas 103; Bermuda 38; Belize 26. |
| Refinery products: | | | |
| Gasoline do | 624 | 379 | Belize 107; Honduras 105; Bahamas 103. |
| Jet fuel and kerosine do | 65 | 101 | Belize 90; Haiti 11. |
| Distillate fuel oil do | 679 | 27 | Belize 20; Cayman Islands 6. |
| Residual fuel oil do | 121 | 87 | All to United States. |
| Lubricants do | 225 | 152 | Panama 15; Guyana 15. |
| Other: | | | |
| Liquefied petroleum gas do | (4) | 158 | Netherlands Antilles 101; Venezuela 54. |
| Petroleum jelly and wax do | (4) | 4 | Barbados 2; Trinidad and Tobago 2. |
| Nonlubricating oils, n.e.s. do | -- | (4) | Mainly to Bahamas. |
| Asphalt do | 4 | 5 | Cayman Islands 3; St. Vincent 2. |
| Bitumen do | -- | 940 | Cayman Islands 757; Belize 183. |
| Total do | 1,718 | 1,853 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | -- | (4) | All to Cayman Islands. |

[1] Scrap tonnage of all nonferrous metals in 1972 was 2,526.
[2] Copper semimanufactures valued at $63 exported to Barbados, Trinidad and Tobago, and United States.
[3] Excludes exports valued at $1,403.
[4] Less than ½ unit.

## Table 12.—Jamaica: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum: | | |
| Bauxite | (1) | -- |
| Oxide and hydroxide | -- | 40 |
| Alumina | (1) | -- |
| Metal and alloys, unwrought and semimanufactures | 11,429 | 7,201 |
| Copper metal and alloys, unwrought and semimanufactures | 941 | 1,236 |
| Gold metal, unworked or partly worked troy ounces | -- | 67 |
| Iron and steel: | | |
| Ore and concentrate | (1) | 30 |
| Metal: | | |
| Scrap | -- | 41 |
| Pig iron, ferroalloys, and similar materials | 450 | 478 |
| Steel, primary forms | -- | 4,248 |
| Semimanufactures | 196,157 | 130,824 |
| Lead: | | |
| Ore and concentrate | (1) | -- |
| Metal and alloys, unwrought and semimanufactures | 322 | 3,102 |
| Magnesium metal and alloys, semimanufactures | -- | 1 |
| Manganese ore and concentrate | 162 | 92 |
| Nickel metal and alloys, unwrought and semimanufactures | 8 | 25 |
| Platinum-group metals and silver: | | |
| Ore and concentrate value | -- | $26 |
| Waste and sweepings do | -- | $470 |
| Metal including alloys: | | |
| Platinum group do | $3,000 | $3,707 |
| Silver troy ounces | (2) | 115,911 |
| Tin metal and alloys, unwrought and semimanufactures long tons | 3,704 | 26,801 |
| Tungsten metal and alloys, unwrought and semimanufactures | -- | 1 |
| Uranium and thorium metals including alloys, unwrought and semimanufactures | -- | 5 |
| Zinc: | | |
| Ore and concentrate | 10 | (1) |
| Metal including alloys: | | |
| Blue powder | -- | 258 |
| Unwrought and semimanufactures | 958 | 418 |

See footnotes at end of table.

## Table 12.—Jamaica: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS—Continued** | | |
| Other: | | |
| Ore and concentrate of metals, n.e.s | 2 | (3) |
| Oxides, hydroxides and peroxides of metals, n.e.s | -- | 186 |
| Scrap of nonferrous metals, not further described | 10 | 5 |
| Nonferrous metals, n.e.s., unwrought and semimanufactures | 8 | 49 |
| **NONMETALS** | | |
| Abrasives, natural: | | |
| Pumice, emery, natural corundum, etc | 829 | 49,429 |
| Grinding and polishing wheels and stones | 35 | 95 |
| Asbestos, crude washed or ground | 756 | 743 |
| Barite, natural | -- | 1,468 |
| Boron, crude natural | -- | 1 |
| Cement, hydraulic | 3,015 | 8,533 |
| Chalk | -- | 186 |
| Clays and clay products: | | |
| Crude | 1,075 | 886 |
| Clay products: [4] | | |
| Nonrefractory | 12,085 | 5,301 |
| Refractory | 3,838 | 68,098 |
| Diamond: | | |
| Gem, not set or strung ... carats | -- | 102 |
| Industrial ... do | -- | 106,594 |
| Diatomite and other infusorial earth | -- | 46 |
| Fertilizer materials: | | |
| Manufactured: | | |
| Nitrogenous | 31,422 | 33,584 |
| Phosphatic | 5,366 | 14,635 |
| Potassic | 12,526 | 9,461 |
| Mixed | 13,838 | 1,663 |
| Ammonia | 85 | 126 |
| Graphite, natural | 567 | 1 |
| Gypsum and plasters | -- | 8,118 |
| Lime | 4 | 11,382 |
| Magnesite, crude | 13 | 587 |
| Mica: | | |
| Crude | 192 | 690,449 |
| Worked | 20 | 73 |
| Pigments, natural crude | -- | 1,903 |
| Precious and semiprecious stones ... carats | (5) | 703 |
| Salt | 10,456 | 339,447 |
| Sodium compounds, n.e.s.: | | |
| Sodium carbonate | 4,966 | 2,731 |
| Sodium hydroxide | 55,016 | 519,600 |
| Stone, sand and gravel: | | |
| Dimension stone | 369 | 7,736 |
| Gravel and crushed stone | 2,364 | 167 |
| Limestone (except dimension) | -- | 56,612 |
| Quartz, unground ... value | $30 | -- |
| Sand including ground quartz | 167 | 391 |
| Stone for industrial use, n.e.s | 906,109 | -- |
| Sulfur: | | |
| Elemental | 3,874 | 381 |
| Sulfur dioxide | (1) | 2 |
| Sulfuric acid | 46 | 2,620 |
| Talc, steatite, soapstone and pyrophyllite | -- | 951 |
| Other nonmetals, n.e.s.: | | |
| Crude | 665 | 11 |
| Slag, dross and similar waste, not metal bearing | -- | 18,375 |
| Building materials of asphalt, asbestos and fiber, cement and unfired nonmetals, n.e.s | -- | 1,096 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Asphalt and bitumen, natural | 1,181 | 1,374 |
| Carbon gas | -- | 29 |
| Coal and briquets | 673 | 77 |
| Coke and semicoke | 861 | 938 |
| Hydrogen, helium and rare gases | | 5 |
| Peat, including briquets and litter ... value | (6) | $65 |
| Petroleum: | | |
| Crude and partly refined ... thousand 42-gallon barrels | 10,046 | 10,623 |

See footnotes at end of table.

Table 12.—Jamaica: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum—Continued | | | |
| Refinery products: | | | |
| Gasoline | thousand 42-gallon barrels | 600 | 1,038 |
| Jet fuel and kerosine | do | 13 | 125 |
| Distillate fuel oil | do | 522 | 2,165 |
| Residual fuel oil | do | 5,831 | 1,191 |
| Lubricants | do | 163 | 111 |
| Other: | | | |
| Liquefied petroleum gas | do | 36 | 158 |
| Petroleum jelly and wax | do | 6 | 7 |
| Nonlubricating oils, n.e.s | do | -- | 2 |
| Asphalt, bitumen, pitch and pitch coke | do | 18 | 781 |
| Petroleum coke | do | (1) | 54 |
| Total | do | 7,189 | 5,632 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | -- | 113 |

[1] Less than ½ unit.
[2] Value of silver metal imported in 1972 was $371,000.
[3] Value of other ore and concentrate of metals in 1973 was insignificant.
[4] Excludes products not reported in quantitatively but valued at $777,552 in 1972 and $27,668 in 1973.
[5] Value of precious and semiprecious stones in 1972 was $63,000.
[6] Fuel briquets (coal, lignite, coke and/or peat) were 447 metric tons in 1972.

## MARTINIQUE [8]

Mineral production in Martinique in 1974 consisted of construction aggregates, clays, marine salt, fertilizers, cement, and petroleum refinery products. Production of crushed stone in 1974 totaled 292,000 tons; salt, 300,000 tons; and pumice, 110,000 tons. No official statistics were reported on the output of fertilizer and cement. Output from the oil refinery on Martinique consisted principally of 1.2 million barrels of residual fuel oil, 1.7 million barrels of gasoline, and 711,000 barrels of distillate fuel oil.

Mineral production on Guadeloupe consisted principally of construction aggregates and cement. Production of crushed stone totaled 385,000 tons; sand, about 255,000 tons; and pozzalon, 175,000 tons. Output from cement operations was not reported in official statistics.

## NETHERLANDS ANTILLES [9]

In a joint venture involving Bonaire Petroleum Corp. N.V. and Northville Industries Corp. (U.S.), construction began in 1974 on a new transshipment terminal at Bonaire. This site is a natural deep-water harbor and is within easy reach of major crude oil shipping routes connecting the Middle East with the Caribbean and the U.S. east coast. The terminal is being constructed on the sheltered northwest coast of the island and is expected to become operational by July 1975. The dock facilities will be capable of handling supertankers up to 500,000 deadweight tons, and will have an initial storage capacity of 5 million barrels of crude oil and petroleum products. The terminal capacity will be expanded later to 15 million barrels on the present 500-acre site. Freight costs are expected to decline when Middle East oil is transported by supertankers to Bonaire, and then transshipped by smaller coastal tankers to the east coast of the U.S. and Canada.

Curaçao's new transshipment center at Bullen Bay opened officially in June 1974. Plans for expansion from 200,000 barrels per day to 825,000 barrels per day is expected by yearend 1975. There will be six jetties capable of handling tankers with capacities from 20,000 deadweight tons to 530,000 deadweight tons.

The Shell Curaçao N.V. refinery at Emmastad, with a capacity of 460,000 barrels per day, and the Lago Oil and Transport Co. on Aruba, with 440,000 barrels per day, may be augmented by another $25 million refinery at Bonaire if the plans of Northville Industries are successful. The production of mineral commodities in the Netherlands Antilles is shown in table 1.

[8] Prepared by Harold J. Drake.
[9] Prepared by Fay B. Dillard.

Table 13.—Netherlands Antilles: Foreign trade in petroleum and petroleum refinery products
(Thousand 42-gallon barrels)

| Commodity | 1972 | 1973 |
|---|---|---|
| **EXPORTS** | | |
| Crude oil | 169 | -- |
| Petroleum refinery products: | | |
| Gasoline, aviation | 3,800 | 2,261 |
| Gasoline, other | 12,579 | 23,877 |
| Jet fuel | 19,278 | 25,360 |
| Kerosine and white spirit | 13,352 | 1,015 |
| Distillate fuel oil | 18,096 | 27,580 |
| Residual fuel oil | 153,101 | 186,653 |
| Lubricants | 5,935 | 3,668 |
| Other | 9,778 | 10,591 |
| Total | 235,919 | 281,005 |
| **IMPORTS** | | |
| Crude oil | 261,141 | 327,161 |
| Petroleum refinery products: | | |
| Gasoline, all grades | 2,100 | -- |
| Jet fuel and kerosine | 211 | 307 |
| Distillate fuel oil | 2,214 | 450 |
| Residual fuel oil | 10,398 | -- |
| Lubricants | 7 | 60 |
| Other | 2,017 | 3,512 |
| Total | 16,947 | 4,329 |

## TRINIDAD AND TOBAGO [10]

The Government of Trinidad and Tobago became the largest government refiner in the Caribbean in 1974 with the purchase of Shell Trinidad Ltd.'s refinery at a cost of about $46.8 million. Total crude production averaged 186,670 barrels per day during 1974 and proved reserves amounted to 2.5 billion barrels. The petroleum industry continued to account for most of the country's export receipts.

### COMMODITY REVIEW

**Metals.**—*Aluminum.*—An agreement was signed in June 1974 by the Governments of Trinidad and Tobago, Guyana, and Jamaica for the construction of a new aluminum smelter in southern Trinidad. Guyana and Jamaica will supply the alumina and Trinidad and Tobago will supply natural gas as the power source for the operations. Construction is planned to begin in January 1976. The smelter will be the first to be owned by the Caribbean nations themselves. Yugoslavia has offered to help finance this venture and several companies, including Kaiser Aluminum & Chemical Corp. and Alumínio Argentino S.A. (Aluar), have shown an interest in providing the technology.

**Mineral Fuels.**—*Petroleum and Natural Gas.*—An exploration and production license was granted in 1974 to a consortium including Texaco Trinidad Ltd. and Trinidad-Tesoro Petroleum Co. Ltd. for an area off the southeast coast. Production-sharing contracts were awarded to Texaco Trinidad, Mobil Oil Corp., Deminex, and Tenneco, Inc., for four offshore tracts. One of the tracts is in the Gulf of Paria off the west coast and three were off the east coast, comprising approximately 1.2 million acres.

Amoco Trinidad Oil Co., Ltd., began development in 1974 of its new Poui Field off the east coast of Trinidad. In early October, the Poui A–1 well tested approximately 4,000 barrels per day of low-sulfur oil. A production platform is being completed adjacent to the drilling platform; however, until it is available, Poui A pro-

[10] Prepared by Fay B. Dillard.

duction will be fed into an 18-inch underwater line connected with other Amoco Trinidad offshore platforms to onshore storage facilities at Galeota Point. At yearend, 52 wells were producing from the seven operational platforms, including the Poui platform, that have been installed by Amoco Trinidad off the east coast of the island. Within the next year, two additional drilling platforms are expected to be completed. Drilling continued in the Samaan and Teak Fields. Amoco Trinidad drilled 18 development wells in 1974, and 29 wells are scheduled for 1975. Crude oil output was approximately 100,000 barrels per day by yearend.

The Government of Trinidad and Tobago purchased the oil properties of Shell Trinidad in August 1974. They include a 100,000-barrel-per-day refinery at Point Fortin in southwestern Trinidad, a chain of service stations, and about 24,000 barrels per day of onshore and offshore crude oil production. The government-owned company was renamed the Trinidad and Tobago Oil Co., Ltd. Trinidad-Tesoro Petroleum Co., Ltd., an affiliate of Tesoro Petroleum Corp. of San Antonio, Tex., has been named to manage the former Shell properties; the operations will be carried out on a fee basis. The Government is a 50.1% partner in Trinidad-Tesoro, which has a production of about 40,000 barrels per day of crude oil and 32 million cubic feet per day of natural gas.

The Government has authorized Shell International to form a new company in Trinidad, to be known as Shell Chemicals and Services—East Caribbean Ltd., to continue the activities of Shell Trinidad that the Government did not acquire. These activities will include providing chemical and aviation services, supplying base oils and additives, and providing the technical services required.

Gross natural gas production increased substantially in 1974 and large reserves have been established. Amoco Trinidad's discovery of proven and potential natural gas reserves off the southeast coast of Trinidad are estimated at 11.2 trillion cubic feet. A new pipeline is to be constructed across Trinidad to take newly discovered gas from the west coast to Point Lisas, where major industrial development is to take place. Plans call for the construction of two 1,200-ton-per-day ammonia plants. Feasibility studies were undertaken on several petroleum-based industrial enterprises. Another industrial project in the planning stage is an iron- and steelworks to make sponge iron, either for use within the Caribbean or for export. The Government expects to hold majority control in these new ventures. During 1974, plans were terminated for the liquefaction of natural gas and its transport to the Texas gulf coast by ocean tankers. Although this was a severe setback to the Government's hopes of developing this new industry, discussions were expected to begin immediately on a new contract for the liquefied natural gas (LNG) plant.

Production of mineral commodities in Trinidad and Tobago is shown in table 1.

The exports and reexports of mineral commodities are reported in table 14. The imports in mineral commodities are reported in table 15.

**Table 14.—Trinidad and Tobago: Exports and reexports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, all forms | | 66 | 23 |
| Copper metal including alloys, all forms | | r 211 | 505 |
| Iron and steel: | | | |
| Scrap | | 11,609 | 8,047 |
| Steel, primary forms | | 11 | 220 |
| Semimanufactures | | 461 | 328 |
| Lead: | | | |
| Ore | | 288 | 139 |
| Metal including alloys, all forms | | 32 | 36 |
| Silver metal including alloys | troy ounces | 1,116 | 5,930 |
| Zinc metal including alloys, all forms | | (1) | (1) |
| Other metals including alloys, all forms | | r 295 | 180 |

See footnotes at end of table.

## Table 14.—Trinidad and Tobago: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| NONMETALS | | | |
| Cement, hydraulic | | (1) | (1) |
| Clays and clay products, including refractory brick | | 1,558 | 591 |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous | | 60,367 | 119,323 |
| Other including mixed | | 44 | 33,517 |
| Lime | | 395 | 380 |
| Precious stones, cut | carats | 1,555 | -- |
| Salt | | 294 | 68 |
| Sodium and potassium compounds | | 9 | 30 |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude | | 2 | 22 |
| Worked | | 2 | (1) |
| Gravel and crushed stone | | 30 | 34 |
| Sand | | 239 | 164 |
| Sulfur: | | | |
| Elemental, all forms | | (1) | 14,127 |
| Sulfuric acid, including oleum | | 294 | 375 |
| Other nonmetals, n.e.s.: | | | |
| Crude | | r 152 | 23 |
| Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s | | 578 | 495 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | | 45,496 | 47,784 |
| Coal, coke, peat | | (1) | 2 |
| Petroleum: | | | |
| Crude and partly refined | thousand 42-gallon barrels | 14,427 | 23,615 |
| Refinery products: | | | |
| Gasoline | do | 19,399 | 17,898 |
| Jet fuel | do | r 8,877 | 7,535 |
| Kerosine | do | r 6,507 | 8,408 |
| Distillate fuel oil | do | r 12,457 | 12,774 |
| Residual fuel oil | do | r 77,217 | 72,954 |
| Lubricants | do | r 1,263 | 858 |
| Other | do | r 1,587 | 1,407 |
| Total | do | 127,307 | 121,834 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | 167,552 | 147,044 |

r Revised.
1 Less than ½ unit.

## Table 15.—Trinidad and Tobago: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum metal including alloys, all forms | 719 | 982 |
| Arsenic and compounds | 16 | 173 |
| Copper: | | |
| Copper sulfate | 4 | 6 |
| Metal including alloys, all forms | r 579 | 490 |
| Iron and steel: | | |
| Scrap | 405 | -- |
| Pig iron, ferroalloys, and similar materials | (1) | 37 |
| Steel, primary forms | 602 | 2,127 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections | 19,096 | 31,410 |
| Universals, plates, sheets | 25,628 | 64,426 |
| Hoop and strip | r 1,188 | 2,773 |
| Rails and accessories | 17 | 2 |
| Wire | 4,572 | 4,723 |
| Tubes, pipes, fittings | r 45,530 | 54,824 |
| Castings and forgings | 107 | 5 |
| Lead: | | |
| Ore and concentrate | 10 | 10 |
| Metal including alloys, all forms | 652 | 566 |
| Nickel metal including alloys, all forms | r 16 | 12 |
| Platinum-group metals and silver: | | |
| Metal including alloys: | | |
| Platinum group | troy ounces 37 | 85 |
| Silver | do 257,702 | 249,327 |
| Tin metal including alloys, all forms | long tons 39 | 19 |
| Zinc metal including alloys, all forms | 292 | 289 |
| Other metals including alloys, all forms, n.e.s | r 27 | 25 |

See footnotes at end of table.

## Table 15.—Trinidad and Tobago: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| NONMETALS | | | |
| Abrasives, natural, n.e.s | | 36 | 2 |
| Aluminum sulfate | | 1,879 | 1,327 |
| Barite and witherite | | 31,975 | 70,756 |
| Cement | | 10,124 | 2,694 |
| Clays and clay products, including all refractory brick: | | | |
| Crude clay, n.e.s | | 1,310 | 1,583 |
| Products | | 4,152 | 4,779 |
| Feldspar | | 676 | 1,079 |
| Fertilizer materials: | | | |
| Crude | | 5 | 90 |
| Manufactured: | | | |
| Nitrogenous | | 344 | 204 |
| Phosphatic | | 748 | 1,370 |
| Potassic | | 3,759 | 3,923 |
| Other, including mixed | | 2,151 | 783 |
| Lime | | 9 | 164 |
| Magnesite | | 10 | (2) |
| Mica, all forms | | 47 | 59 |
| Pigments, mineral | | 56 | 66 |
| Precious and semiprecious stones, cut and uncut | carats | 156 | 3,421 |
| Salt | | 12,452 | 48,538 |
| Sodium and potassium compounds, n.e.s.: | | | |
| Sodium hydroxides | | 4,833 | 8,787 |
| Potassium hydroxides, sodic and potassic peroxides | | 2,995 | 4,086 |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude | | 16,836 | 18,677 |
| Worked | | 17 | 69 |
| Gravel and crushed stone | | 407 | 1,332 |
| Sand | | 378 | 55 |
| Sulfur: | | | |
| Elemental | | 18,897 | 3,073 |
| Sulfuric acid | | 1,862 | 3,584 |
| Other nonmetals, n.e.s.: | | | |
| Crude | | r 1,862 | 782 |
| Building materials of asphalt, unfired nonmetals, and fiber cement, n.e.s | | 1,360 | 543 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | | 20 | 7 |
| Coal, coke and briquets | | 407 | 106 |
| Petroleum: | | | |
| Crude and partly refined | thousand 42-gallon barrels | 107,214 | 103,923 |
| Refinery products: | | | |
| Gasoline | do | 198 | -- |
| Kerosine and jet fuel | do | -- | 66 |
| Distillate fuel oil | do | 86 | -- |
| Residual fuel oil | do | 73 | 131 |
| Lubricants | do | 67 | 48 |
| Liquefied petroleum gas[3] | do | 14 | 276 |
| Other | do | 1,942 | 87 |
| Total | do | 2,380 | 608 |
| Mineral tar and other coal-, petroleum- or gas-derived crude chemicals | | 57 | 76 |

r Revised.
1 Revised to none.
2 Less than ½ unit.
3 Government of Trinidad and Tobago, Ministry of Petroleum and Mines.

Source: Unless otherwise specified Government of Trinidad and Tobago, Central Statistical Office, Overseas Trade. Part A, Port of Spain, 1972 and 1973.

# The Mineral Industry of Central American Countries

By Ronald J. DeFilippo [1]

## CONTENTS



## BELIZE

Belize imported over 80% of its mineral requirements including all of its petroleum supplies in 1974. Mineral production was confined to limestone, sand, gravel, and marl, all for internal use. The total value of all mineral production was about $2.6 million [2] compared with $3.4 million in 1973.

The Caribbean Development Bank approved loans to Belize totaling almost $16 million for a deepwater port, roads, electric power, an industrial center, and other projects.

[1] Physical scientist, Division of Nonferrous Metals.
[2] Where necessary, values have been converted from Belize dollars (BZ) to U.S. dollars at the rate of BZ$1.60=US$1.00.

**Table 1.—Central American Countries: Production of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **BELIZE** | | | |
| Limestone e | 276,000 | 245,000 | 246,000 |
| Marl e | 180,000 | 26,000 | 30,000 |
| Sand and gravel e | 303,000 | 393,000 | 383,000 |
| **COSTA RICA** | | | |
| Cement | 260,537 | 271,816 | 297,922 |
| Clays: | | | |
| Kaolin | NA | NA | 225 |
| Other cubic meters | NA | 110,000 | 100,000 |
| Diatomite | e 21,000 | e 30,000 | 31,400 |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous, gross weight | 47,620 | 42,006 | 43,243 |
| Mixed and unspecified, gross weight | 56,735 | 57,490 | 27,157 |
| Gold troy ounces | e 7,800 | 7,806 | 18,000 |
| Iron and steel: Magnetite sand, gross weight | -- | e 2,000 | NA |
| Lime | e 11,500 | e 12,850 | 21,750 |
| Petroleum refinery products: | | | |
| Gasoline thousand 42-gallon barrels | 666 | 690 | 604 |
| Kerosine do | 167 | 180 | 133 |
| Distillate fuel oil do | 1,323 | 1,213 | 1,319 |
| Residual fuel oil do | 748 | 776 | 614 |
| Pumice cubic meters | -- | 2,115 | 3,115 |
| Salt, marine | 11,497 | 13,000 | 13,605 |
| Silver troy ounces | -- | 290 | 3,000 |

See footnotes at end of table.

## Table 1.—Central American Countries: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **COSTA RICA—Continued** | | | |
| Stone, sand and gravel: | | | |
| Limestone and other calcareous material | e 401,210 | e 408,000 | 384,321 |
| Marble — cubic meters | -- | 1,099 | 5,900 |
| Marine shell — do | -- | 5,000 | 13,000 |
| Quartzite — do | NA | NA | 2,660 |
| Sand and gravel | 157,850 | 181,528 | 210,000 |
| Silica sands — cubic meters | NA | NA | 15,000 |
| Other | 550,000 | 632,500 | 1,060,000 |
| **EL SALVADOR** | | | |
| Aluminum metal, semimanufactures | 1,089 | 1,694 | 2,064 |
| Cement | r 217,828 | 235,243 | 291,400 |
| Fertilizers, manufactured | 86,000 | 82,033 | 100,052 |
| Gold, fine — troy ounces | 2,861 | 5,233 | 6,022 |
| Gypsum e | 6,000 | 6,000 | 6,000 |
| Iron and steel, steel semimanufactures | 22,292 | 27,764 | 20,112 |
| Petroleum refinery products: | | | |
| Gasoline — thousand 42-gallon barrels | 800 | 919 | 875 |
| Kerosine — do | 250 | 384 | 248 |
| Jet fuel [1] — do | 78 | -- | 102 |
| Distillate fuel oil — do | 830 | 1,141 | 1,207 |
| Residual fuel oil — do | 1,121 | 1,378 | 1,610 |
| Other: | | | |
| Liquefied petroleum gas — do | 203 | 213 | 185 |
| Asphalt — do | -- | 125 | 134 |
| Refinery fuels and losses — do | 198 | 236 | 60 |
| Total — do | 3,480 | 4,396 | 4,421 |
| Salt | 29,325 | 35,131 | 26,013 |
| Silver, fine — troy ounces | 177,144 | 122,677 | 167,900 |
| Stone, limestone and seashells | 341,273 | e 350,000 | e 350,000 |
| **GUATEMALA** | | | |
| Antimony, mine output, metal content | 1,177 | 1,745 | 436 |
| Cadmium (contained in zinc concentrate) | (2) | 2 | -- |
| Cement — thousand tons | 264 | 310 | 310 |
| Clays: | | | |
| Bentonite — cubic meters | NA | NA | 2,402 |
| Kaolin — do | NA | NA | 220 |
| Other | NA | NA | 28,068 |
| Copper, content of concentrate | -- | -- | e 1,800 |
| Feldspar | e 2,000 | e 2,000 | 30,000 |
| Gypsum e | 8,000 | 8,000 | 12,500 |
| Iron ores, gross weight | -- | -- | e 4,536 |
| Lead: | | | |
| Mine output, metal content | 138 | 102 | e 110 |
| Metal, including secondary | 22 | 65 | 227 |
| Lime | e 23,000 | e 23,000 | 56,233 |
| Mica | e 2,400 | e 2,500 | -- |
| Petroleum refinery products: | | | |
| Gasoline — thousand 42-gallon barrels | 1,629 | 1,781 | 1,771 |
| Kerosine and jet fuel — do | 734 | 759 | 658 |
| Distillate fuel oil — do | 1,787 | 2,007 | 2,069 |
| Residual fuel oil — do | 1,903 | 2,074 | 2,063 |
| Other: | | | |
| Liquefied petroleum gas — do | 126 | 111 | 101 |
| Unspecified — do | 4 | 2 | 3 |
| Refinery fuel and losses — do | 227 | 261 | 154 |
| Total — do | 6,410 | 6,995 | 6,819 |
| Salt | NA | NA | 8,884 |
| Stone, sand and gravel: | | | |
| Crushed and broken: | | | |
| Limestone — thousand tons | e 600 | e 600 | 400 |
| Volcanic ash e — do | 54 | 55 | 32 |
| Marble — cubic meters | NA | 650 | 1,200 |
| Quartz | e 18,000 | e 18,000 | 14,400 |
| Sand and gravel — cubic meters | NA | NA | 418,000 |
| Talc | NA | NA | 11 |
| Tungsten, concentrate (W content) | 8 | 158 | 9 |
| Zinc, mine output, metal content | 308 | 280 | -- |

See footnotes at end of table.

**Table 1.—Central American Countries: Production of mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **HONDURAS** | | | |
| Antimony, mine output, metal content | 30 | 48 | 135 |
| Cadmium, mine output, metal content | 244 | 247 | 217 |
| Cement | 194,014 | 235,309 | 214,747 |
| Copper, mine output, metal content | NA | NA | 186 |
| Gold, troy ounces | 2,021 | 795 | 2,124 |
| Gypsum | 15,806 | 13,979 | 8,509 |
| Lead, mine output, metal content | 20,724 | 18,544 | 18,784 |
| Petroleum refinery products: | | | |
| Gasoline, thousand 42-gallon barrels | 712 | 727 | 704 |
| Jet fuel, do | 64 | 71 | 71 |
| Kerosine, do | 252 | 250 | 245 |
| Distillate fuel oil, do | 1,178 | 1,248 | 1,217 |
| Residual fuel oil, do | 1,784 | 1,875 | 1,788 |
| Liquefied petroleum gas, do | 90 | 102 | 86 |
| Refinery fuel and losses, do | 74 | 235 | 158 |
| Total, do | 4,154 | 4,508 | 4,269 |
| Salt e | 27,000 | 32,000 | 32,000 |
| Silver, thousand troy ounces | 3,595 | 3,152 | 3,661 |
| Stone, crushed and broken | 303,524 | 350,000 | 315,465 |
| Zinc ore and concentrate, metal content | 23,295 | 19,669 | 23,960 |
| **NICARAGUA** | | | |
| Cement | r 117,623 | 192,195 | 235,732 |
| Copper, mine output, metal content | 2,788 | 1,401 | 1,775 |
| Gold, mine output, metal content, troy ounces | 110,672 | 85,051 | 82,639 |
| Gypsum and anhydrite, crude | 26,000 | e 35,000 | e 35,000 |
| Lead, ore and concentrate, metal content | 4,281 | 1,396 | 3,398 |
| Lime | NA | NA | e 38,610 |
| Petroleum refinery products: | | | |
| Gasoline, thousand 42-gallon barrels | 945 | 1,198 | 1,166 |
| Kerosine and jet fuel, do | 251 | 290 | 237 |
| Distillate fuel oil, do | 845 | 1,065 | 1,153 |
| Residual fuel oil, do | 1,134 | 1,137 | 1,328 |
| Other: | | | |
| Liquefied petroleum gas, do | 151 | 160 | 161 |
| Asphalt, do | -- | -- | 134 |
| Unspecified, do | -- | 57 | 64 |
| Refined fuel and losses, do | 229 | 247 | 87 |
| Total, do | 3,555 | 4,154 | 4,330 |
| Salt, marine e | 15,000 | 10,000 | 10,000 |
| Silver, mine output, troy ounces | 476,717 | 180,157 | 269,787 |
| Stone, crushed and broken | NA | NA | e 400,000 |
| Zinc, ore and concentrate, metal content | 17,495 | 11,147 | 14,818 |
| **PANAMA** | | | |
| Cement | r 294,740 | 364,573 | 395,020 |
| Clays and clay products: | | | |
| Crude clays, n.e.s | e 94,850 | 237,218 | 229,895 |
| Products | e 20,000 | 93,073 | 110,000 |
| Gold, fine, troy ounces | NA | NA | 11 |
| Iron and steel: Magnetite sand, gross weight | 77,074 | NA | -- |
| Petroleum refinery products: | | | |
| Gasoline, thousand 42-gallon barrels | 3,063 | 2,858 | e 2,700 |
| Kerosine and jet fuel, do | 2,941 | 3,078 | e 2,000 |
| Distillate fuel oil, do | 5,398 | 4,424 | e 4,000 |
| Residual fuel oil, do | 15,070 | 14,042 | e 14,000 |
| Other: | | | |
| Liquefied petroleum gas, do | -- | 339 | e 300 |
| Asphalt, do | -- | 93 | e 100 |
| Unspecified, do | 857 | 571 | e 600 |
| Refinery fuel and losses, do | 1,007 | 619 | e 500 |
| Total, do | 28,336 | 26,024 | e 24,200 |
| Salt, marine | 10,978 | 20,455 | 22,704 |
| Stone, sand and gravel: | | | |
| Limestone | e 189,700 | 3 355,830 | 527,032 |
| Other, thousand cubic meters | e 1,703 | 2,007 | e 3,034 |

e Estimate. p Preliminary. r Revised. NA Not available.
1 Sales.
2 Less than ½ unit.
3 Excludes an amount reported in volumetric units at 8,000 cubic meters.

## COSTA RICA

Of the commodities showing the largest increases in production in 1974 over that of 1973 are silver, 934%; marble, 437%; gold, 131%; lime, 69%; and cement, 10%.

President Quiros outlined the Government's economic policy for the next 4 years at his inauguration in May. Included were plans for more active development of the country's reserves of bauxite, sulfur, copper, iron and gold, and development of basic industries, notably hydroelectricity, petrochemicals, and cement. Some of the problems which have hindered development in the past were an inadequate transportation system, incomplete geological information, the small size of most ore bodies, and the low grades of most mineral occurrences.

**Table 2.—Costa Rica: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, unwrought and semimanufactures | 63 | 221 | Guatemala 139; El Salvador 65; Panama 15. |
| Iron and steel including alloys, all forms | 11,301 | 12,188 | Nicaragua 7,710; Panama 2,501; El Salvador 1,291. |
| Lead metal including alloys, all forms | -- | 12 | Mainly to El Salvador. |
| Zinc metal including alloys, all forms | -- | 13 | All to Nicaragua. |
| Other, nonferrous base metals including alloys, all forms [1] | 15 | 59 | Nicaragua 27; United States 21; Panama 8. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s., grinding and polishing wheels and stones | 61 | 106 | All to Nicaragua. |
| Cement | 1,294 | -- | |
| Clays and clay products including nonclay refractory brick | 120 | 234 | Nicaragua 162; Panama 24; Honduras 23. |
| Diatomite and other infusorial earth | -- | 1 | All to Nicaragua. |
| Fertilizer materials: | | | |
| Crude, phosphatic | -- | 2 | Do. |
| Manufactured: | | | |
| Nitrogenous | 24,682 | 24,207 | Mexico 12,341; Panama 4,171; Guatemala 3,510. |
| Other, including mixed | 52,443 | 59,390 | Panama 25,502; Nicaragua 15,361; Colombia 10,827. |
| Gypsum | -- | 15 | All to Nicaragua. |
| Lime | 121 | 78 | Panama 77; Nicaragua 1. |
| Pigments, mineral, crude | -- | 35 | Panama 20; Nicaragua 15. |
| Salt | 2 | 3 | All to Nicaragua. |
| Stone: | | | |
| Dimension stone | 1,054 | 422 | Panama 414; Guatemala 7. |
| Other | 118 | 1,190 | Panama 1,149; Nicaragua 41. |
| Sulfur, sulfuric acid | 1 | -- | |
| Other, building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s | 65 | 538 | Nicaragua 535; Puerto Rico 2. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Petroleum refinery products: | | | |
| Gasoline, thousand 42-gallon barrels | (2) | 1 | Mainly to Panama. |
| Kerosine, do | (2) | -- | |
| Distillate fuel oil, do | 196 | 109 | Mainly to bunkers. |
| Lubricants, do | (2) | 16 | Do. |
| Total, do | 196 | 126 | |

[1] May include aluminum scrap.
[2] Less than ½ unit.

## Table 3.—Costa Rica: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS [1] | | | |
| Aluminum metal including alloys, all forms | 1,989 | 2,625 | France 697; United States 427; El Salvador 350. |
| Copper: | | | |
| Copper sulfate | 13 | 26 | United Kingdom 11; United States 10; West Germany 3. |
| Metal including alloys, all forms | 854 | 862 | Mexico 671; Japan 94; United States 39. |
| Iron and steel metal: | | | |
| Pig iron, ferroalloys, and similar materials | 71 | 126 | West Germany 120; United States 5. |
| Steel, primary forms | 23,703 | 23,461 | Venezuela 10,227; United States 5,681; France 2,857. |
| Semimanufactures | 75,419 | 65,072 | Japan 36,659; Belgium-Luxembourg 9,006; United States 5,115. |
| Lead metal including alloys, all forms | 94 | 177 | West Germany 69; United States 41; Peru 40. |
| Nickel metal including alloys, all forms | 4 | 6 | United Kingdom 2; United States 1; Japan 1. |
| Platinum-group metals including alloys, all forms ---- troy ounces | 7,491 | 7,813 | United States 7,716; United Kingdom 97. |
| Silver metal including alloys ---- do | 41,217 | 12,507 | United States 12,282; United Kingdom 96; West Germany 96. |
| Tin metal including alloys, all forms ---- long tons | 13 | 6 | United States 3; Panama 2. |
| Zinc metal including alloys, all forms | 2,518 | 2,116 | Mexico 576; Canada 451; Netherlands 301. |
| Other: | | | |
| Ore and concentrate of nonferrous base metals, n.e.s | 603 | 641 | Mexico 613; United States 28. |
| Waste and scrap of nonferrous base metals | 12 | 10 | All from Panama. |
| Metals: | | | |
| Pyrophoric alloys ---- kilograms | 317 | 106 | West Germany 67; United States 29 |
| Nonferrous base metals including alloys, all forms, n.e.s | 18 | 14 | United States 11; Japan 1; Belgium-Luxembourg 1. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s | 49 | 63 | United States 20; West Germany 17; Spain 6. |
| Asbestos | 822 | 1,181 | Canada 951; United States 96; Botswana 62. |
| Boron materials, oxide and acid | 49 | 49 | Mainly from United States. |
| Cement | 3,347 | 13,767 | Nicaragua 9,145; Japan 2,043; Belgium-Luxembourg 1,224. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s | 1,354 | 1,668 | United Kingdom 829; United States 281; Mexico 8. |
| Products: | | | |
| Refractory (including nonclay brick) | 325 | 688 | United States 565; Canada 92; Mexico 18. |
| Nonrefractory | 1,679 | 1,628 | Nicaragua 1,282; Guatemala 116; Colombia 64. |
| Diamond, industrial ---- carats | 90,000 | 130,000 | United States 115,000; Republic of South Africa 15,000. |
| Diatomite and other infusorial earth | 386 | 327 | Mexico 319; United States 7. |
| Feldspar, fluorspar, and cryolite | 290 | 367 | United States 274; Guatemala 58; Nicaragua 35. |
| Fertilizer materials: | | | |
| Crude, phosphatic and potassic | 5,359 | 14 | United States 9; West Germany 5. |
| Manufactured: | | | |
| Nitrogenous | 86,500 | 87,539 | United States 34,513; Netherlands 32,736; West Germany 5,395. |
| Phosphatic | 29,432 | 39,947 | United States 33,802; Mexico 4,940; El Salvador 1,060. |
| Potassic | 43,337 | 40,768 | United States 38,480; West Germany 2,285. |
| Other, including mixed | 11,506 | 5,458 | Netherlands 2,184; United States 1,668; Poland 958. |
| Graphite, natural | 2 | 5 | West Germany 4; United States 1. |

See footnotes at end of table.

## Table 3.—Costa Rica: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Gypsum and anhydrite | 11,761 | 14,449 | Nicaragua 13,500; Honduras 431; West Germany 380. |
| Lime | 470 | 420 | Nicaragua 395; Mexico 20; United Kingdom 4. |
| Mica, all forms | 2 | 10 | West Germany 6; United States 3. |
| Precious and semiprecious stones, including gem diamond ---- kilograms | 43 | 17 | West Germany 9; Switzerland 3; Italy 3. |
| Salt and brine | 9,961 | 20,764 | Nicaragua 19,119; Honduras 909; United States 566. |
| Sodium compounds, n.e.s.: | | | |
| Caustic soda | 3,840 | 3,939 | Nicaragua 3,705; United States 190; Guatemala 20. |
| Soda ash | 581 | 760 | Colombia 454; West Germany 143; United States 117. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 172 | 121 | Italy 57; Guatemala 32; Nicaragua 15. |
| Worked | 68 | 95 | United States 46; Italy 27; Nicaragua 11. |
| Industrial stone | 7 | 55 | Nicaragua 41; United States 11. |
| Sand, gravel, and crushed rock, n.e.s | 299 | 292 | United States 283; Nicaragua 9. |
| Other | 5 | 2 | All from United States. |
| Sulfur: | | | |
| Elemental, all forms | 11 | (2) | All from Guatemala. |
| Sulfur dioxide | r 1 | (2) | Mainly from United States. |
| Sulfuric acid | 234 | 369 | El Salvador 287; Netherlands 59; Mexico 13. |
| Talc, soapstone, and pyrophyllite | 892 | 617 | Italy 237; Republic of Korea 163; United States 159. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | 1,379 | 1,395 | Mexico 706; Colombia 529; United States 80. |
| Coal and coke, including briquets | 303 | 496 | West Germany 374; Colombia 58; Netherlands 45. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 2,694 | 3,440 | All from Venezuela. |
| Refinery products: | | | |
| Gasoline ---- do | 268 | 423 | Panama 176; Netherlands Antilles 147; Venezuela 42. |
| Kerosine ---- do | 62 | 110 | Netherlands Antilles 53; United States 18; Panama 14. |
| Distillate fuel oil ---- do | 389 | 695 | Venezuela 514; Netherlands Antilles 147; Panama 31. |
| Lubricants (including grease) ---- do | 104 | 109 | United States 34; Netherlands Antilles 31; Trinidad and Tobago 21. |
| Other: | | | |
| Liquefied petroleum gas ---- do | 99 | 118 | Panama 54; Nicaragua 41; Venezuela 20. |
| Naphtha ---- do | (2) | (2) | All from United States. |
| Paraffin ---- do | 20 | 20 | West Germany 8; People's Republic of China 5; United States 3. |
| Petrolatum ---- do | 2 | 3 | United States 2. |
| Unspecified ---- do | r 213 | 157 | United States 153; Nicaragua 2. |
| Total ---- do | r 1,157 | 1,635 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 1,041 | 1,959 | United States 1,655; Netherlands Antilles 290; United Kingdom 11. |

r Revised.

1 Metal oxides and hydroxides excluded as they were reported inseparably from metal salts and other compounds.

2 Less than ½ unit.

### COMMODITY REVIEW

**Metals.**—*Aluminum, Copper, Lead, and Zinc.*—Exploration for bauxite continued on the Santa Flera peninsula at Cordillera de Talamanca. Construction of a smelter scheduled to begin in 1974 was delayed.

Swiss Aluminium Mining of Costa Rica, S.A. (SAMCOSA), was developing its Cerro Boruca mine near San Isidro del General and was also exploring a copper-molybdenum prospect. SAMCOSA was also developing its Bajo de Limon lead-zinc mine near Turrucares by incline and adit.

*Gold.*—Bulora Corp. Ltd., through its subsidiary Esperanza Mines Corp., completed underground development and surface facilities at the reopened El Libano mine located near Tilaran. The modern cyanide process plant has a capacity of 100 tons per day which could be increased later to 200 tons per day. A 15-degree decline was being driven with sufficient size to permit trackless mining. The company's property around the mine encompassed 35 square kilometers and was reported to have many gold showings. The company was looking at other old gold properties in Costa Rica and negotiations were underway regarding three of them.

**Mineral Fuels.**—*Petroleum.*—Costa Rica imported all its petroleum requirements from Venezuela. Late in the year the Government offered offshore gas and oil exploration concessions in an attempt to develop domestic reserves.

Planning was still underway for four new 200,000-barrel-per-day oil refineries to supplement the Government's small facility at Puerto Limon.

## EL SALVADOR

Gold and silver production were up 15% and 37%, respectively, over that of 1973. Production of extruded aluminum increased by 22%.

The Comisión Ejecutiva Hidroelectrica del Rio Lempe (CEL) was nearing completion of a 30-megawatt geothermal plant. Two similar plants were planned in the same area by 1977 and 1979. CEL was also making studies on a new hydroelectric plant at San Lorenzo. The construction of hydroelectric and geothermal powerplants was intended to end El Salvador's dependence on petroleum for electrical power generation.

**Table 4.—El Salvador: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum metal and alloys, all forms | | 1,768 |
| Copper: | | |
| Copper sulfate | | (1) |
| Metal and alloys, all forms | | 4 |
| Iron and steel: | | |
| Scrap | | 26 |
| Semimanufactures | | 15,596 |
| Nickel metal and alloys, all forms | | (1) |
| Silver metal including alloys | troy ounces | 129 |
| Tin metal and alloys, all forms | long tons | 11 |
| Zinc metal and alloys, all forms | | (1) |
| Other nonferrous metals: | | |
| Scrap | | 68 |
| **NONMETALS** | | |
| Abrasives, natural | | 150 |
| Cement: | | |
| Worked dimension stone | | 1,509 |
| Clays: | | |
| Clays, refractory products | | -- |
| Kaolin | | 144 |
| Fertilizer materials: | | |
| Phosphatic | | 1,492 |
| Potassic | | 48 |
| Manufactured: | | |
| Nitrogenous | | 3,102 |
| Other fertilizer | | 46,811 |
| Lime | | 8 |
| Pigments, crude earth | | (1) |

See footnote at end of table.

## Table 4.—El Salvador: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1973 |
|---|---|---|
| NONMETALS—Continued | | |
| Salt: | | |
| Refined | | 97 |
| Unrefined | | 13,754 |
| Other | | 132 |
| Sulfur and sulfuric acid | | 1,853 |
| Stone, sand and gravel: | | |
| Dimension stone, unworked | | 10 |
| Other | | 16,952 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Petroleum refinery products: | | |
| Gasoline | thousand 42-gallon barrels | 181 |
| Lubricants | do | 99,394 |
| Other: | | |
| Liquefied petroleum gas | do | 70,104 |
| Unspecified | do | 27,488 |

[1] Less than ½ unit.

## Table 5.—El Salvador: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum metal including alloys: | | |
| Unwrought | 1,333 | 1,625 |
| Semimanufactures | 2,140 | 2,687 |
| Copper: | | |
| Copper sulfate | 8 | 5 |
| Metal including alloys, all forms | 1,687 | 1,616 |
| Iron and steel metal: | | |
| Scrap | 924 | 2,967 |
| Pig iron, ferroalloys and similar materials | 84 | 174 |
| Steel, primary forms | 27,072 | 35,364 |
| Semimanufactures | 35,617 | 41,284 |
| Other | | |
| Lead metal including alloys, all forms | 534 | 419 |
| Nickel metal including alloys, all forms | 5 | 4 |
| Silver metal including alloys, troy ounces | 7 | 9 |
| Tin metal including alloys, all forms, long tons | 21 | 25 |
| Zinc metal including alloys, all forms | 921 | 1,791 |
| Other: | | |
| Ore and concentrate | 6 | 1 |
| Base metals including alloys, all forms | 38 | 42 |
| NONMETALS | | |
| Abrasives, natural | 58 | 82 |
| Asbestos | 1,239 | 1,924 |
| Boron materials, oxide and acid | 8 | 8 |
| Cement | 4,589 | 3,318 |
| Clays and products (including all refractory brick): | | |
| Crude: | | |
| Kaolin | 1,625 | 1,959 |
| Other | 130 | 469 |
| Products | 1,540 | 1,503 |
| Diamond, industrial, carats | 300 | 235 |
| Diatomite and other infusorial earth | 552 | 446 |
| Feldspar and fluorspar | 122 | 128 |
| Fertilizer materials, crude and manufactured: | | |
| Nitrogenous | 193,670 | 228,984 |
| Phosphatic | 15,109 | 60,121 |
| Potassic | 8,022 | 9,929 |
| Other including mixed | 36,018 | 45,429 |
| Graphite, natural | 3 | 1 |
| Gypsum and plasters | 3,249 | 3,223 |
| Lime | 3,008 | 4,590 |
| Mica, all forms | -- | 20 |
| Pigments, mineral, crude | 5 | 192 |
| Salt (excluding brine) | 22 | 26 |
| Sodium compounds, n.e.s.: | | |
| Sodium carbonate | 541 | 1,445 |
| Sodium hydroxide | 7,312 | 5,944 |

Table 5.—El Salvador: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel: | | | |
| Dimension | | 4,837 | 4,079 |
| Gravel and crushed rock | | 156 | 657 |
| Sand | | 53 | 328 |
| Sulfur: | | | |
| Elemental, all forms | | 6,949 | 7,239 |
| Sulfuric acid | | 600 | 691 |
| Talc, soapstone, pyrophyllite | | 126 | 192 |
| Other nonmetals, n.e.s | | 343 | 777 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | | 10,598 | 636 |
| Coal and coke including briquets | | 384 | 337 |
| Petroleum: | | | |
| Crude and partly refined | thousand 42-gallon barrels | 3,048 | 4,562 |
| Refinery products: | | | |
| Gasoline | do | 55 | 68 |
| Kerosine | do | 13 | 65 |
| Distillate fuel oil | do | 108 | 108 |
| Lubricants | do | 37 | 36 |
| Mineral jelly and wax | do | 14 | 17 |
| Other: | | | |
| Liquefied petroleum gas | do | 11 | 1 |
| Bitumen and other residues | do | 4 | 1 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | 58 | 104 |

## COMMODITY REVIEW

**Metals.**—*Gold.*—San Sebastian Mines, Inc., increased production to 1,200 troy ounces of gold per month. The property was being exploited under lease by San Sebastian Gold Mines, Inc., of Nevada. Still in the planning stage was a $1 million program to improve efficiency by reducing mining and processing costs from $65 to $45 per ounce. The deposits are located in the eastern part of El Salvador.

Minas San Cristobal, S.A., owned by Canadian Javelin, Ltd., was completing development of its Encuentos gold and silver mine. The San Cristobal mine produced throughout the year; the ore assayed 5 troy ounces of silver and 0.087 troy ounces of gold per ton. Both mines will send ore to the Minas San Cristobal mill where plans were underway to increase capacity from 32,000 tons to 75,000 tons of ore per year. Drilling programs were in progress, and if sufficient ore reserves are discovered, the capacity of the plant may be increased to as much as 150,000 tons per year by 1977.

**Mineral Fuels.**—Late in the year, the Government opened a major offshore tract to oil exploration. Approximately 19,000 square kilometers were being offered in 33 exploratory zones including one area of potential contention with Honduras located opposite the mouth of the Gulf of Fonesca. The Comisión Nacional del Petroleo received numerous inquiries from United States and other foreign firms interested in bidding for these concessions. The oil exploration program was being handled under the legal aegis of Decree 86 (September 13, 1974), an executive order amplifying the existing Mining Code and Complementary Law on Mining.

The Ministry of Economy requested an additional $70,000 [3] to initiate oil exploration and development surveys by the Comisión Nacional del Petroleo.

# GUATEMALA

On June 12 the Guatemalan Congress passed a decree amending the 1955 petroleum code. Under the decree, petroleum operations contracts rather than government-granted concessions would be awarded as a basis for exploration or exploitation. The taxation system was also altered so that petroleum companies would pay an in-kind tax equivalent to 40% of total petroleum production. There was no required percentage of Guatemalan equity participation, but no operations would be

[3] Where necessary, values have been converted from El Salvador colon(ES¢) to U.S. dollars at the rate of ES¢1.00=US$0.40.

allowed to exceed a 30-year duration. There would be no import duties on petroleum equipment or raw materials unless available in Guatemala. Exports of petroleum would be exempt from duties. The petroleum code was not to be retroactive.

### COMMODITY REVIEW

**Metals.**—*Copper.*—The Oxec copper mine in Santa María Cahabon was the newest and most important metal producer in 1974. The concession for the mine was held by Transmetales Limitada, a division of Recursos del Norte Limitada, which in turn is a subsidiary of Basic Resources International, a Luxembourg firm. Production from the mine, with a capacity of 25,000 tons per year, will be sold to the Spanish smelting firm Rio Tinto Patino, S.A., an affiliate of Rio Tinto-Zinc Corp., Ltd., a United Kingdom company. The first shipment of copper concentrate left Puerto Barricos at the end of March. Reserves at the mine were equivalent to about 5 years of production.

*Nickel.*—The most important mineral development for Guatemala was the anticipated mining and refining of nickel near El Estor by Exploraciones y Explotociones Mineras Izabel, S.A. (Exmibal), a joint venture between International Nickel Co. Inc. and The Hanna Mining Co. When the plant is completed in 1976, it will produce 12,700 tons of nickel per year in the form of a sulfide matte containing 75% nickel. Exmibal was also exploring for petroleum to provide an adequate supply of fuel at reasonable cost for the plant. The plant would require 21 kilograms of petroleum per kilogram of nickel produced.

*Silver.*—Plata Ltd., a firm owned by two resident Americans, was exploring for silver near San Pedro Sacatepequez. If enough reserves can be proven, the company may begin production in 2 years. Tormex was exploring for silver in the Department of Chiquimila. Diamond drilling gave encouraging results but production was not expected to begin until yearend 1975

*Zinc.*—Tormex Mining Developers, Ltd., was involved in a program of diamond drilling and drifting at its Minas de Oriente zinc-lead-silver concession 70 miles east of Guatemala City. A small portion of the 40-square-kilometer concession was explored. Reserves of 1.6 million tons of ore grading 6% zinc were outlined and determined to be suitable for open pit mining.

**Nonmetals.**—*Feldspar and Silica.*—Industria Centroamericana de Vidrio, S.A. (Cavisa), the local glass manufacturing plant, began to supply some of its own feldspar and silica sand. Feldspar reserves were considered sufficient for 60 years at a production rate of 50,000 tons per year. About two-thirds of the feldspar production was planned for export. The doubling of the price of silica sand on the international market encouraged Cavisa to begin exploiting domestic deposits, but none of the sand was to be exported.

**Mineral Fuels.**—*Petroleum.*—Shenandoah Oil Corp. in a joint venture with three other companies reported encouraging results from the Rubelsanto No. 1 well in northeast Guatemala, about 10 miles from the Gulf coast. In the best test the well flowed at a rate of 2,250 barrels per day of 30-degree gravity oil from intervals at depths of 1,578 and 1,601 meters. The total depth of the well was 1,624 meters. Late in the year, two more wildcats were being drilled in the same Rubelsanto structure where the Shenandoah group has exploration rights on 900,000 acres. This discovery was the first successful petroleum venture in the country and drilling was initiated as a result of finds in the neighboring Chiapas-Tabasco Field of Mexico and sulfur exploration drill holes. The Cretaceous oil-producing formation may extend from Mexico through to Belize. By yearend the Government had 35 applications from interested oil companies for exploration permits.

## HONDURAS

Mine production of antimony and gold more than doubled over that of 1973 while cadmium production increased 53%; lead, 1%; silver, 16%; and zinc, 22%. The mining industry of Honduras contributed about 2% to the gross national product.

The Government publicly recognized the need for foreign investment to supplement Honduran capital in the development process. Public sentiment is that foreign investors should participate on a minority basis wherever possible. The labor law requires at least 90% Honduran employment at most enterprises.

## Table 6.—Honduras: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, all forms | 2 | -- | |
| Antimony ore and concentrate | 48 | 41 | Belgium 28; United States 13. |
| Cadmium ore and concentrate | 99 | 127 | Japan 74; United States 33. |
| Gold metal ---- troy ounces | 333 | 735 | NA. |
| Iron and steel metal including alloys, all forms | 1,231 | 3,976 | Spain 2,506; Mexico 775; Guatemala 339. |
| Lead ore and concentrate | 16,852 | 18,038 | Mainly to United States. |
| Silver: | | | |
| Ore and concentrate thousand troy ounces | 2,997 | 3,105 | United States 2,550; Japan 513. |
| Metal including alloys ---- do | 302 | 273 | All to United States. |
| Zinc: | | | |
| Ore and concentrate | 17,762 | 21,587 | Japan 13,853; United States 4,783. |
| Metal including alloys, all forms | 109 | 58 | All to Nicaragua. |
| Other: | | | |
| Ash and residue containing nonferrous metals | 264 | 99 | West Germany 32; United States 26; Netherlands 22. |
| Metal including alloys, all forms | -- | 1 | All to Nicaragua. |
| NONMETALS | | | |
| Cement | 50,456 | 70,863 | Dominican Republic 17,358; United States 17,329; Belize 10,974. |
| Clays and clay products | 3 | -- | |
| Fertilizer materials, manufactured, nitrogenous | -- | 26 | Belize 18; Guatemala 8. |
| Salt | 29 | 1,233 | Costa Rica 891; Nicaragua 342. |
| Sodium and potassium compounds, n.e.s., caustic soda | 12 | -- | |
| Stone, sand and gravel: | | | |
| Dimension stone | 46 | 25 | Belize 10; Nicaragua 9; United States 5. |
| Other | 17,225 | -- | |
| Other nonmetals, n.e.s., building materials | 34 | 478 | Mainly to Costa Rica. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Petroleum refinery products: | | | |
| Gasoline ---- 42-gallon barrels | 1,320 | 890 | All to Netherlands Antilles. |
| Kerosine thousand 42-gallon barrels | -- | 15 | All to Dominican Republic. |
| Distillate fuel oil ---- do | 66 | 30 | Mainly to Trinidad and Tobago. |
| Residual fuel oil ---- do | 1,376 | 1,325 | Dominican Republic 1,046; Panama 279. |
| Lubricants ---- 42-gallon barrels | 110 | 296 | Guatemala 128; Belize 103; Nicaragua 65. |
| Other: | | | |
| Liquefied petroleum gas ---- do | 18,297 | 22,161 | Guatemala 18,757; Belize 3,186. |
| Mineral jelly and wax ---- do | 20 | -- | |
| Pitch, resin, petroleum asphalt, and coke from petroleum ---- do | 447 | -- | |

NA Not available.

## Table 7.—Honduras: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, all forms | 492 | 836 | United States 372; Panama 82; Austria 68. |
| Copper: | | | |
| Ore and concentrate | (1) | (1) | All from United States. |
| Copper sulfate | 83 | 62 | United States 48; U.S.S.R. 14. |
| Metal including alloys, all forms | 45 | 49 | United States 24; Italy 11; Canada 6. |
| Iron and steel metal including alloys, all forms | 28,159 | 47,764 | Belgium-Luxembourg 12,380; France 7,610; United States 7,411. |

See footnote at end of table.

## Table 7.—Honduras: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Lead: | | | |
| Ore and concentrate | -- | (1) | All from Guatemala. |
| Metal including alloys | 148 | 164 | United States 51; Mexico 47; Belgium-Luxembourg 40. |
| Nickel metal including alloys | (1) | (1) | West Germany 224. |
| Platinum-group metals (excluding silver) troy ounces | 1,029 | -- | |
| Silver metal including alloys, all forms do | 4,180 | 2,829 | Mainly from United States. |
| Tin metal including alloys, all forms long tons | 12 | 11 | United States 6; United Kingdom 3; Guatemala 2. |
| Zinc metal including alloys | 383 | 1,081 | Japan 590; Belgium-Luxembourg 427. |
| Other: | | | |
| Ore and concentrate, n.e.s | (1) | -- | |
| Ash and residue containing nonferrous metals, n.e.s | (1) | -- | |
| Metals including alloys, all forms, n.e.s | 49 | 24 | Mainly from United States. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s | 28 | 35 | United States 10; Mexico 7; Italy 6. |
| Asbestos | 1,804 | 1,350 | Mainly from Canada. |
| Cement | 3,055 | 3,828 | Nicaragua 1,640; Japan 905; West Germany 556. |
| Clays and clay products (including all refractory brick): | | | |
| Crude, kaolin and other clays or earth | 1,448 | 1,181 | United States 827; Guatemala 201. |
| Products, including nonclay brick | 1,076 | 1,267 | United States 696; Nicaragua 217; Italy 101. |
| Diamond, industrial kilograms | -- | 2 | All from United States. |
| Diatomite and other infusorial earth | 571 | 1,707 | Mainly from Nicaragua. |
| Fertilizer materials, crude and manufactured | 39,399 | 45,985 | Netherlands 18,060; West Germany 10,966; Belgium-Luxembourg 7,587. |
| Graphite, natural | (1) | (1) | All from United States. |
| Gypsum and plasters | 40 | 21 | Mainly from United States. |
| Lime | 609 | 429 | West Germany 309; United States 120. |
| Mica | (1) | (1) | United States 336; Nicaragua 174. |
| Pigments, mineral, natural, crude | 8 | 6 | Mainly from West Germany. |
| Precious and semiprecious stones, except diamond troy ounces | 161 | 579 | Switzerland 289; West Germany 161. |
| Salt | 452 | 405 | United States 320. |
| Sodium and potassium compounds: | | | |
| Caustic soda | 1,104 | 2,091 | Mainly from United States. |
| Caustic potash | 18 | 17 | Do. |
| Stone, sand and gravel: | | | |
| Dimension stone, all forms | 12 | 97 | Mainly from Guatemala. |
| Sand (including ground quartz) | 10 | 17 | France 10; West Germany 5. |
| Other stone | -- | 72 | Mainly from France. |
| Sulfur: | | | |
| Elemental, all forms | 109 | -- | |
| Sulfuric and sulfurous acids | 356 | 263 | Netherlands 132; United States 87; West Germany 43. |
| Talc and steatite | 46 | 58 | United States 18; Italy 17; United Kingdom 11. |
| Other nonmetals, n.e.s., crude | 17 | 101 | United States 77; West Germany 14; Belgium-Luxembourg 10. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt, natural | (1) | (1) | All from United States. |
| Coal and coke, including briquets | 140 | 201 | Colombia 118; United States 65; Belgium-Luxembourg 18. |
| Hydrogen | 1 | 13 | United States 7; West Germany 6. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 4,429 | 4,763 | Mainly from Venezuela. |
| Refinery products: | | | |
| Gasoline do | 61 | 59 | Netherlands Antilles 50; Panama 6. |
| Kerosine and jet fuel do | 2 | 3 | Mainly from Nicaragua. |
| Distillate fuel oil do | r 305 | 291 | Mainly from Netherlands Antilles. |
| Residual fuel oil do | 9 | (1) | Mainly from United States. |
| Lubricants do | 56 | 61 | United States 40; Jamaica 12; Netherlands Antilles 8. |

See footnotes at end of table.

Table 7.—Honduras: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum—Continued | | | |
| Refinery products—Continued | | | |
| Other: | | | |
| Liquefied petroleum gas thousand 42-gallon barrels | 1 | 1 | Mainly from Nicaragua. |
| Mineral jelly and wax do | 8 | 9 | United States 4; Japan 3; Colombia 2. |
| Unspecified do | 78 | 40 | Netherlands Antilles 33; Venezuela 5. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 3,425 | 2,503 | United States 2,007; Venezuela 315. |

r Revised.
1 Less than ½ unit.

## COMMODITY REVIEW

**Metals.**—*Silver, Gold, Lead, and Zinc.*—Rosario Resources Corp. (Rosario) owned the El Mochito mine in the Department of Santa Barbera, the largest mining operation in Honduras. Higher metal prices and 95% increase in mine production in 1974 gave El Mochito the most profitable year in its 26-year history.

Production at El Mochito in 1974 is shown in the following tabulation:[1]

| | Silver (troy ounces) | Gold (troy ounces) | Lead (metric tons) | Zinc (metric tons) |
|---|---|---|---|---|
| Lead concentrates | 2,527,264 | 1,319 | 19,096 | 2,935 |
| Zinc concentrates | 682,878 | 566 | 1,500 | 20,311 |
| Doré bullion | 220,373 | 252 | -- | -- |
| Total | 3,430,515 | 2,137 | 20,596 | 23,246 |

1 Data differs from that shown on table 1 because of difference in source.

Cadmium contained-in-concentrates amounted to 247 and 217 tons in 1973 and 1974, respectively.

El Mochito produced 297,511 tons of ore grading 7.83% lead, 8.61% zinc, 11.19 troy ounces of silver and 0.007 troy ounce of gold per ton. Development activities were concentrated on the delineation of the Yojoa and Main ore bodies on the 1850 level. Exploration, delineation, and development of the San Juan ore body continued; the first shrinkage stope on the 1350 level was placed in operation late in 1974 and a second stope was started.

Ore reserves in the Main and Yojoa ore bodies were given as 1.6 million tons grading 10.32% lead, 10.62% zinc, and 12.3 troy ounces of silver and 0.007 troy ounce of gold per ton. San Juan ore body reserves were increased to 3.7 million tons grading 2.88% lead, 7.74% zinc, 0.38% copper, and 2.93 troy ounces of silver, and 0.002 troy ounce of gold per ton. Total reserves of both ore bodies were thus increased by 873,690 tons to 5,258,221 tons with an average grade of 5.73 ounces of silver and 0.003 troy ounce of gold per ton; 5.10% lead; 8.60% zinc, and 0.26% copper.

An exploration program was initiated using geophysical and geochemical methods to trace the Porvenir fault zone from the San Juan ore body to the southwest. Rosario's exploration teams cut 46 miles of exploration lines for this project. Overall exploration of the Mochito Basin suggested a number of new target areas related to geological structure extrapolated from the El Mochito mine.

The American Smelting and Refining Company/Rosario joint venture began a deep exploration program utilizing the old Rosario mine in which almost 5,000 meters of adit and drilling work was conducted. Rosario was investigating the possibility of another joint venture with Imperial Smelting Ltd. and Brownsville Refining Co. to establish a smelter to process zinc, lead, and copper. Rosario planned to use the

sulfuric acid from the smelter to produce fertilizer from Rosario's phosphate deposits in Florida.

Allizanza Industrial, S.A., a subsidiary of NRD Mining Ltd. of Canada, started a program to determine the potential of the Tatumbula gold prospect near Tegucigalpa. The prospect was explored in 1950 and at that time 225,000 tons of ore grading 0.2 troy ounce of gold per ton and 0.5 troy ounce of silver per ton was indicated.

**Nonmetals.**—*Cement.*—Bell Western Corp. planned to spend $50 million, to build a 600,000-ton-per-year cement plant, located between Omoa and Cuyamel on the north coast. Ancillary developments at the site would include a bulkloading port facility and a limestone mine, and the first development of domestic coal deposits for use in fueling the cement kilns.

**Mineral Fuels.**—*Coal.*—For fueling its cement plant kilns, Bell Western applied to the Government for rights to exploit a coal deposit in the Province of Yoro some 30 kilometers from the town of Victoria. The coal would be transported by pipeline as a slurry to Santa Rita and then by rail to the plants at Puerto Cortes.

*Petroleum.*—Exploration activity increased on concessions held by 12 companies, and additional concessions were requested by two companies. The companies active in exploration were Mobil Oil Co. Ltd., Signal Oil Co., Union Oil Co., Standard Oil of California, Petroleos Hondorenos, S.A., Shell Oil Co., Louisiana Land Exploration, and Petroleos de Atlantido, S.A. Mobil held concessions under three different names: Mobil Company of Honduras, Mobil Petroleum Honduras, and Mobil Exploration Honduras. Petroleos Weeks de Honduras and Empresa Centro Americano de Inversiones, S.A., were also seeking exploration areas.

## NICARAGUA

Significant increases in production over those of 1973 were registered in copper, silver, lead, zinc, and cement. Gold production decreased slightly.

Representatives of Nicaragua and Honduras negotiated the extension of their bilateral trade treaty which will maintain significant trade in mineral products between the countries.

**Table 8.—Nicaragua: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 p | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, all forms | 65 | 35 | Honduras 25; Guatemala 10. |
| Copper: | | | |
| Ore and concentrate | 5,371 | 7,730 | All to West Germany. |
| Metal including alloys, all forms | 2 | (1) | All to Honduras. |
| Iron and steel metal: | | | |
| Scrap | 2 | 528 | All to El Salvador. |
| Semimanufactures | 6,724 | 4,868 | Mainly to Honduras. |
| Lead: | | | |
| Ore and concentrate | 4,502 | 4,485 | All to United States. |
| Metal including alloys, all forms | -- | 10 | All to Honduras. |
| Silver metal, worked and partly worked troy ounces | 154,741 | 144,550 | Canada 119,247; United States 25,303. |
| Zinc: | | | |
| Ore and concentrate | 26,587 | 27,932 | United States 24,029; Belgium 3,903. |
| Metal including alloys, all forms | -- | 15 | All to El Salvador. |
| Other scrap and waste of nonferrous metals | 4,150 | 4,503 | Taiwan 2,570; El Salvador 1,240. |
| NONMETALS | | | |
| Abrasives, natural | 16 | 9 | All to Guatemala. |
| Cement | 1,084 | 10,927 | Costa Rica 9,330; Honduras 1,566. |
| Clay products: | | | |
| Refractory (including nonclay brick) | 5 | 34 | All to Costa Rica. |
| Nonrefractory | 2,389 | 1,979 | Costa Rica 1,249; El Salvador 281; Honduras 235. |
| Diatomite | 1,334 | 1,572 | All to Honduras. |
| Feldspar and related material | 58 | 35 | All to Costa Rica. |

See footnotes at end of table.

## Table 8.—Nicaragua: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 p | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials: | | | |
| Crude nitrogenous | -- | 3 | All to El Salvador. |
| Manufactured: | | | |
| Nitrogenous | 22 | 10 | Ecuador 7; Costa Rica 3. |
| Phosphatic | -- | 284 | All to Honduras. |
| Gypsum and plasters | 11,585 | 13,352 | Mainly to Costa Rica. |
| Lime | 445 | 392 | All to Costa Rica. |
| Salt | 9,144 | 19,017 | Mainly to Costa Rica. |
| Sodium and potassium compounds, caustic soda | 12,667 | 14,179 | El Salvador 5,608; Guatemala 4,682; Costa Rica 3,699. |
| Stone, sand and gravel: | | | |
| Dimension stone, crude and partly worked | 49 | 22 | All to Costa Rica. |
| Sand including ground quartz | 14 | 21 | All to Honduras. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Petroleum: | | | |
| Crude and partly refined | | | |
| Gasoline 42-gallon barrels | 97 | -- | |
| Gasoline do | 120 | 2,120 | Costa Rica 953; El Salvador 665; Guatemala 455. |
| Kerosine do | 18,892 | 15,238 | Mainly to Costa Rica. |
| Distillate fuel oil do | -- | 690 | Guatemala 572; Honduras 118. |
| Lubricants do | 2 | 2 | All to Honduras. |
| Other: | | | |
| Liquefied petroleum gas | 48,427 | 44,185 | Mainly to Costa Rica. |
| Pitch, resin, petroleum asphalt, petroleum coke and other byproducts of coal and petroleum, n.e.s. do | 259,296 | 202,278 | Do. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 924 | 926 | El Salvador 475; Guatemala 434. |

p Preliminary.
[1] Less than ½ unit.

## Table 9.—Nicaragua: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 p | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, all forms | 900 | 964 | El Salvador 355; Canada 275; United States 105. |
| Copper: | | | |
| Ore and concentrate | 82 | -- | Mainly from United States. |
| Copper sulfate | 148 | 150 | Mainly from Costa Rica. |
| Copper metal, including alloys, all forms | 87 | 73 | United States 18; Union of South Africa 17; West Germany 12. |
| Iron and steel metal: | | | |
| Scrap | 1 | 4 | Mainly from Costa Rica. |
| Primary forms | 4,733 | 11,586 | Mainly from France. |
| Semimanufactures | 35,529 | 54,591 | Japan 14,395; Costa Rica 7,623; United States 6,988. |
| Lead metal including alloys, all forms | 159 | 251 | Mexico 213; Guatemala 35. |
| Nickel metal including alloys, all forms kilograms | 172 | 75 | All from United States. |
| Silver metal, worked and partly worked troy ounces | 8,134 | 6,044 | United States 5,273; United Kingdom 707. |
| Tin metal including alloys, all forms long tons | 18 | 26 | United Kingdom 14; Guatemala 5; United States 4. |
| Zinc metal including alloys, all forms | 682 | 815 | United States 364; Belgium 220; Japan 160. |
| Other: | | | |
| Ore and concentrate of base metals, n.e.s | (1) | 1 | Mainly from United Kingdom. |
| Scrap of nonferrous metals | 28 | 30 | Mainly from Honduras. |
| Base metals including alloys, all forms, n.e.s | 11 | (1) | NA. |

See footnotes at end of table.

## Table 9.—Nicaragua: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 p | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS | | | |
| Abrasives, natural | 125 | 220 | Costa Rica 103; France 59. |
| Asbestos | 488 | 1,415 | Mainly from Canada. |
| Asphalt, natural ---- kilograms -- | -- | 227 | All from United States. |
| Boric acid | 21 | 5 | West Germany 2; Netherlands 2; United States 1. |
| Cement | 859 | 2,008 | Japan 1,565; Denmark 211. |
| Clays and clay products: | | | |
| Crude clays, n.e.s | 3,105 | 4,564 | United States 2,791; United Kingdom 1,477. |
| Products: | | | |
| Refractory | 641 | 608 | United States 418; Costa Rica 94. |
| Nonrefractory | 232 | 208 | Italy 50; Japan 42; Spain 37. |
| Diatomite | 285 | 138 | Mainly from Mexico. |
| Feldspar and related material | 646 | 908 | Guatemala 683; United States 226. |
| Fertilizer materials: | | | |
| Crude ---- kilograms -- | 732 | 321 | All from United States. |
| Manufactured: | | | |
| Nitrogenous | 56,178 | 86,479 | Netherlands 34,866; Mexico 19,094; United States 13,498. |
| Phosphatic | 24,190 | 34,117 | United States 22,461; Costa Rica 9,944; Canada 1,707. |
| Potassic | 7,554 | 9,472 | United States 8,117; Costa Rica 703; West Germany 651. |
| Other | 10,114 | 5,462 | Netherlands 3,032; Canada 1,407; Costa Rica 793. |
| Graphite, natural | 5 | 4 | Mexico 2; West Germany 2. |
| Gypsum and plasters | 217 | 227 | Mainly from United Kingdom. |
| Lime | 1,424 | 1,583 | United Kingdom 1,180; West Germany 159. |
| Mica, worked, including splittings and waste ---- kilograms -- | 611 | 1,104 | Mainly from West Germany. |
| Pigments, mineral, natural | (1) | 5 | Do. |
| Precious and semiprecious stones, including diamond ---- kilograms -- | 15 | 14 | Mexico 6; West Germany 4; Switzerland 3. |
| Salt | 11,879 | 29,639 | Mainly from Mexico. |
| Sodium and potassium compounds, n.e.s | 528 | 647 | United States 267; West Germany 182; Netherlands 63. |
| Stone, sand and gravel | 164 | 333 | Costa Rica 162; Guatemala 81; United States 64. |
| Sulfur: | | | |
| Elemental | 152 | 222 | United States 152; West Germany 70. |
| Sulfuric acid | 541 | 682 | Mainly from El Salvador. |
| Talc | 233 | 224 | United States 166; Italy 55. |
| Other: | | | |
| Crude nonmetallic minerals, n.e.s | 197 | 115 | Mexico 83; Guatemala 19; United States 14. |
| Meerschaum, amber, jet kilograms -- | 11 | -- | |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black | 3 | 3 | All from West Germany. |
| Coal, coke, peat | 118 | 79 | West Germany 60; United States 17. |
| Hydrogen, helium and rare gases kilograms -- | 173 | 9,581 | All from United States. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels -- | 3,706 | 3,512 | Mainly from Venezuela. |
| Refinery products: | | | |
| Gasoline ---- do ---- | 85 | 100 | Mainly from Netherlands Antilles. |
| Kerosine ---- do ---- | 19 | 95 | Do. |
| Distillate fuel oil ---- do ---- | 222 | 359 | Panama 173; Colombia 81; Netherlands Antilles 55. |
| Lubricants ---- do ---- | 45 | 69 | United States 39; Netherlands Antilles 14; Jamaica 13. |
| Other: | | | |
| Liquefied petroleum gas 42-gallon barrels -- | 29 | 193 | United States 89; Belgium 85; West Germany 18. |
| Mineral jelly and wax thousand 42-gallon barrels -- | 9 | 15 | Japan 9; Columbia 3. |
| Pitch, resin, petroleum asphalt, petroleum coke ---- do ---- | 1 | 1 | Mainly from United States. |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 6,027 | 6,187 | United States 4,533; Trinidad 788; Netherlands Antilles 740. |

p Preliminary. NA Not available.
1 Less than ½ unit.

## COMMODITY REVIEW

**Metals.**—*Copper.*—Rosario Mining of Nicaragua, Inc., a wholly-owned subsidiary of Rosario Resources, Inc., acquired a permit to mine about 1.2 million tons of copper ore grading 0.36% copper from below the bottom of the main Rosita pit. A total of about 610,000 tons of ore was milled from the main pit and from a small auxiliary pit known as the R–13. By yearend Rosario was converting the copper mill at Rosita to a gold mill.

*Gold.*—Rosario Resources spent most of the year rehabilitating the shaft and dewatering the Siuna mine. At yearend, proven reserves at Siuna were 2.6 million tons grading 0.097 troy ounce of gold per ton; probable reserves were 6.7 million tons grading 0.074 troy ounce of gold per ton. Late in the year, Rosario resumed ore deliveries from the Riscos de Oro mine, an open pit gold mine about 15 miles from the Rosita mine. Total deliveries were 13,400 tons of gold-silver ore grading 0.055 troy ounce of gold and 3.76 troy ounces of silver per ton. The Rosita copper mill was being converted to a 500-ton-per-day gold mill with a cyanide section. The discovery of considerable gold reserves including those at closed gold-silver mines was the main factor in converting the Rosita mill to a silver-gold operation. Rosario was conducting intensified surface exploration and drilling on the 4,424-square-kilometer plot surrounding the Siuna, Rosita, and Riscos de Oro mines. Exploration also was conducted on a 495-square-kilometer section of the Riscos property.

**Nonmetals.**—*Cement.*—Production of portland cement increased for the second consecutive year from 192,195 tons in 1973 to 235,732 tons in 1974, reflecting a continued demand for construction materials in Managua, damaged in the 1972 earthquake. Once Managua is rebuilt, cement manufacturers believe that cement will be exported to other Central American countries. The capacity of Nicaragua's only cement manufacturing plant was increased from 193,000 to 270,000 tons.

**Mineral Fuels.**—*Petroleum.*—Nicaragua imported all its crude and refined petroleum from Venezuela. Crude oil imports increased by 8% over those of 1973. There was one petroleum refinery in Nicaragua which was operated by Esso Standard Oil, S.A., with an installed refining capacity of 21,000 barrels per day. Texaco Inc. and Gulf Oil Corp. began oil exploration on the Pacific Continental Shelf. Texasgulf had a 3-million-acre oil and gas concession off the Pacific coast. Partners in the venture were Royal Dutch Shell, El Paso Natural Gas Co., and Oceanic Exploration Co. A test well was drilled by El Paso on an adjacent concession and several large structures were mapped. An exploration well was planned for 1975.

# PANAMA

The major mineral industry of the country was mining of construction materials but there was very active exploration for copper materials and petroleum refining. Panama imported all its crude oil from Ecuador, Venezuela, and Saudi Arabia for its single refinery. Panama's major mineral export commodity were refiinery products which were shipped to the United States.

**Table 10.—Panama: Imports of mineral commodities [1]**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum: | | |
| Bauxite and concentrate, gross weight | 348 | 433 |
| Metal including alloys, all forms | 172 | NA |
| Copper metal including alloys, all forms | r 2,344 | 2,458 |
| Gold metal, unworked or partly worked ---- troy ounces | 868 | NA |
| Iron and steel: | | |
| Scrap, (including iron and steel filings) | 1,711 | NA |
| Pig iron, ferroalloys, and similar materials (includes iron and steel powders) | 183 | NA |
| Iron and steel, primary forms | 18,637 | 6,158 |
| Semimanufactures | 37,645 | 28,252 |

See footnotes at end of table.

## Table 10.—Panama: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS—Continued** | | |
| Lead: | | |
| Ore and concentrate, gross weight | 10 | NA |
| Metals including alloys, all forms | 331 | 276 |
| Nickel metal including alloys, all forms | 1 | NA |
| Platinum-group metals and silver: | | |
| Ore and concentrate ... kilograms | 21 | NA |
| Metals, including alloys, all forms: | | |
| Platinum group ... troy ounces | 96 | NA |
| Silver ... do | 16,172 | NA |
| Tin: | | |
| Ore and concentrate, gross weight ... long tons | 31 | NA |
| Metals, including alloys, all forms ... do | r 56 | NA |
| Zinc: | | |
| Ore and concentrate, gross weight | 1 | NA |
| Oxide | 26 | NA |
| Metal including alloys, all forms | 389 | 759 |
| Other metals including alloys, all forms | r 695 | 978 |
| **NONMETALS** | | |
| Abrasives natural, n.e.s., except diamond | 15 | NA |
| Asbestos | 165 | 431 |
| Cement | r 68,815 | 6,374 |
| Clays and clay products (including all refractory brick): | | |
| Crude clays, n.e.s | 740 | NA |
| Products: | | |
| Refractory (including nonclay brick) | 1,393 | 892 |
| Nonrefractory | 426 | 762 |
| Diamond, industrial ... carats | 15,000 | NA |
| Diatomite and other infusorial earth | 227 | NA |
| Feldspar and fluorspar | 36 | NA |
| Fertilizer materials, manufactured: | | |
| Nitrogenous | 24,476 | 15,885 |
| Phosphatic | 135 | NA |
| Potassic | 7 | 2,570 |
| Other including mixed | 32,866 | 29,984 |
| Graphite, natural | 13 | NA |
| Gypsum and plasters: | | |
| Gypsum | 16,978 | NA |
| Plasters | 257 | NA |
| Mica, all forms | 7 | NA |
| Precious and semiprecious stones, except diamond ... kilograms | 24 | 40 |
| Salt (excluding brine) | 1,806 | 4,051 |
| Sodium and potassium compounds, n.e.s | 259 | NA |
| Stone, sand and gravel | 313 | NA |
| Sulfur elemental, all forms | 21 | NA |
| Talc, steatite, soapstone, pyrophyllite | 292 | NA |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Coal, all grades including briquets | 8,169 | 12,326 |
| Coke and semicoke | 630 | NA |
| Petroleum: | | |
| Crude and partly refined ... thousand 42-gallon barrels | r 28,069 | 126,721 |
| Refinery products: | | |
| Gasoline ... do | 5 | NA |
| Kerosine ... do | 2 | NA |
| Distillate fuel oil ... do | r 182 | 136 |
| Residual fuel oil ... do | r 64 | NA |
| Lubricants ... do | 61 | 72 |
| Other ... do | r 8 | 10 |
| Total ... do | 322 | NA |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 265 | NA |

r Revised. NA Not available.

[1] Excludes metallic oxides and hydroxides (except zinc oxide) which are reported inseparably from metallic salts.

## COMMODITY REVIEW

**Metals.**—*Copper.*—From 1965 to 1974 about one-half of Panama was explored for copper mineralization. By yearend 1974 four major copper deposits were being investigated: Cerro Charca by Asarco Exploration Co. (subsidiary of American Smelting and Refining Company); Cerro Colorado by Pavonia Exploration, S.A. (owned by Canadian Javelin, Ltd. (CJL)); Cerro Petaquilla by Cobre Panamá, S.A. (Cobre); and Rio Pito, which is to be further explored by Noranda Exploration, a subsidiary of Noranda Mines, Ltd.

In evaluating the impact of the exploitation of copper resources, the Panamanian Director for Mineral Resources recommended that the net profit of private industry should be at least 15%, while Government participation in gross earnings should be at least 60%. He estimated that over the 4- to 5-year period necessary to recoup the original investment, an annual average of $81 million would be earned by the Government and $54 million by industry. These figures were based on a production average of 100,000 tons per day of 0.6% copper ore for the entire copper industry.

Of the four major copper projects in Panama, the Cerro Colorado deposit located in Chiriqui Province has drawn the most attention. By yearend CJL, through its subsidiary, Pavonia Exploration, was organizing a Canadian-British-Japanese consortium to explore the deposit. The Government was still considering the proposed contract at yearend.

Diamond drilling of the Cerro Colorado deposit by Pavonia showed 2 billion tons of proven copper ore reserves and an additional 2 billion tons combined probable and possible reserves all grading about 0.61% copper. The government-owned Banco Nacional S.A. estimated that the Cerro Colorado deposit could employ 3,000 to 4,000 workers. Plans called for daily production and processing of 80,000 tons of ore which would give the mine an operating life of 50 years. Development of the mine and related plant facilities would require 5 years and would cost an estimated $500 to $800 million.

Meanwhile, Cobre reported a potential of 300 million tons of ore from which yearly production would be about 30,000 tons of copper. Intensive exploration was planned to start in May 1975 and to continue through September 1977. Cobre was formed by Japanese interests headed by Mitsui Mining & Smelting Co., Ltd., and the deposits are located in the petaquilla area of Colón Province.

*Gold.*—In addition to its Cerro Colorado holdings, Pavonia obtained a 68,131-hectare exploration concession in Veraguas Province to outline and extend gold reserves. When Pavonia gained the concession, it announced that it would seek to transfer it to Ottenia, S.A., which is to two-thirds owned by Bison Petroleum and Minerals Ltd. and one-third owned by CJL.

**Mineral Fuels.**—*Petroleum.*—By yearend Panama had no petroleum production and although limited exploration continued as part of a general study on the utilization of the Isthmus as a transportation corridor, a pipeline route was proposed which would extend from Palo Grande (Tocumen) to Bahia Las Minas. The project would also include a pipeline and refinery. The Government would need an estimated $3.5 million for recommended plan studies and land acquisition. Panama would also need to secure crude oil supply commitments from Ecuador, Peru, and possibly from private oil companies to make the trans-Isthmus venture viable. If Panama should become a major petroleum producer, the pipeline and port facilities would be an asset for any potential export trade.

# The Mineral Industry of Other Areas of South America

# (Ecuador, French Guiana, Guyana, Paraguay, Surinam, Uruguay)

By Staff, Bureau of Mines

## CONTENTS



## ECUADOR [1]

In 1974, the Ecuadorean economy showed a 45% increase in its current gross domestic product (GDP) compared with that of 1973. Rising petroleum investment, production, and revenues accounted for a substantial portion of an average yearly GDP growth rate of over 8% since 1970. Higher prices for crude petroleum, other mineral commodities, and tropical products contributed to rising export values, totaling about $1.2 billion during the year.

In February, the U.S. Export-Import Bank authorized a direct loan of $2.66 million to Empresa Electrica del Ecuador (EMELEC) and a financial guarantee for an additional $2.66 million loan by Chase Manhattan Bank, New York. The $5.3 million financing was for U.S. equipment and services in expansion of the Estero Salado Thermal Power Station in Guayaquil.

The Government was negotiating new contracts with petroleum companies at yearend. The contracts were expected to grant Corporación Estatal Petrólera Ecuatoriana (CEPE), the state-owned petroleum corporation, the option to acquire an initial 25% equity participation in each company venture, to be increased to 51% under specified conditions.

Among the country's mineral products, petroleum showed the largest increase in value, owing mainly to world price increases in 1974. Petroleum was the principal export totaling, in value, about $613 million compared with $600 million in 1973. The Texaco-Gulf consortium was the only significant producer of crude oil. Its concessions in Oriente Province (upper Amazon River Basin) produced about 240,000 barrels per day until April, when the Government established a production limit of 210,000 barrels per day. This was 16% below the capacity of the connecting pipeline, which terminates on the Pacific Coast at Esmeraldas. Along the geological trend with Texas-Gulf's holdings in Oriente Province, Cayman del Ecuador, the operator for an American consortium, reportedly was ready to enter production at 10,000 barrels per day from its 827,000-acre concession, pending final agreement of terms governing operations.

Work continued at yearend on the construction of a $92 million, 55,600 barrel-per-day refinery at Esmeraldas. A Japanese contracting firm planned to have the facility on-stream in the latter part of 1976. Existing refinery capacity was reportedly about 35,000 barrels per day; 13.1 million barrels of petroleum was processed into refined products during the year. Refinery

[1] Prepared by Thomas G. Clarke, physical scientist, Division of Nonferrous Metals.

output was up about 11% over that in 1973.

In June, CEPE declared it was increasing its equity participation in the Texaco-Gulf consortium to 25% from a former 16% share. Taxes were also increased. A pipeline break, caused by surface flooding, occurred near yearend, reducing production to 70,000 barrels per day in November. Crude production for the year was 16% less than in 1973. Another pipeline break, near Esmeraldas, interrupted production in February 1975.

Proven reserves of petroleum in the Texaco-Gulf concession amounted to 1.8 billion barrels of oil, equivalent to about 20 years of production at established rates. The trans-Andean pipeline used by Texaco-Gulf was estimated to be expandable to 400,000 barrels per day with the addition of several pumping stations. Proven petroleum reserves for the country totaled 5.3 billion barrels, with total resources in all areas estimated at 115 billion barrels.

Outputs of copper and byproduct gold and silver were lower, but zinc production increased over that of 1973. The production of lead concentrate was 143 tons. A total of 32,667 tons of rolled iron and steel products was produced by one firm in Guayaquil during the year. A production increase was recorded in cement.

During the year, the Government determined that five nondomestic companies were qualified to bid on mining concessions in Azuay Province. The two prospective areas for the bidding are in the Chaucha area—a $50 million project expected to result in the processing of 7,000 tons per day of copper-molybdenum ore and the La Plata deposit expected to yield 150 tons per day of copper-lead-zinc-silver concentrates.

**Table 1.—Other Areas of South America: Production of mineral commodities**

| Area, commodity, and unit of measure | 1972 | 1973 | 1974 p |
|---|---|---|---|
| ECUADOR [1] | | | |
| Cadmium, mine output, metal content ——— kilograms | NA | NA | 573 |
| Cement, hydraulic ——— thousand metric tons | 482 | 485 | e 500 |
| Clays: | | | |
| Bentonite ——— do | -- | (2) | NA |
| Kaolin ——— do | r e 1 | 1 | 1 |
| Copper, mine output, metal content ——— metric tons | 438 | 304 | 179 |
| Gas, natural: | | | |
| Gross production ——— million cubic feet | 5,328 | NA | NA |
| Marketable production e ——— do | 500 | 5,500 | 2,200 |
| Gold, mine output, metal content ——— troy ounces | 12,623 | 10,420 | 7,752 |
| Gypsum (for cement) ——— metric tons | 233 | 265 | 230 |
| Iron and steel semimanufactures ——— thousand metric tons | -- | -- | 33 |
| Lead concentrate ——— metric tons | -- | -- | 143 |
| Natural gas liquids: | | | |
| Natural gasoline ——— thousand 42-gallon barrels | 119 | 117 | 109 |
| Liquefied petroleum gases ——— do | 50 | 50 | 63 |
| Total ——— do | 169 | 167 | 172 |
| Petroleum: | | | |
| Crude oil ——— do | 28,579 | 76,221 | 63,678 |
| Refinery products: | | | |
| Gasoline ——— do | 3,572 | 4,065 | 4,838 |
| Jet fuel ——— do | -- | 911 | 960 |
| Kerosine ——— do | 400 | 400 | 594 |
| Distillate fuel oil ——— do | 2,235 | 2,606 | 3,113 |
| Residual fuel oil ——— do | 2,878 | 3,013 | 3,278 |
| Lubricants ——— do | 1 | -- | 97 |
| Other: | | | |
| Liquefied petroleum gas ——— do | 10 | 25 | 37 |
| Unspecified ——— do | 414 | 186 | 13 |
| Refinery fuel and losses ——— do | 607 | 672 | 140 |
| Total ——— do | 10,117 | 11,878 | 13,070 |
| Silver, mine output, metal content ——— troy ounces | 69,465 | 56,711 | 35,277 |
| Stone, sand and gravel: | | | |
| Limestone for cement ——— thousand metric tons | 70 | 37 | 40 |
| Quartz ——— do | 3 | 2 | NA |
| Sulfur, elemental, from ores ——— metric tons | 549 | 655 | NA |
| Zinc, mine output, metal content ——— do | 49 | e 54 | 202 |

See footnotes at end of table.

## Table 1.—Other Areas of South America: Production of mineral commodities—Continued

| Area, commodity, and unit of measure | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **FRENCH GUIANA** | | | |
| Columbite-tantalite ---------- kilograms -- | 1,145 | -- | -- |
| Gold, mine output, metal content ---------- troy ounces -- | 997 | 1,334 | 1,138 |
| **GUYANA [1]** | | | |
| Aluminum: | | | |
| Bauxite, dry equivalent, gross weight ---------- thousand metric tons -- | r 3,342 | 3,276 | 3,267 |
| Alumina ---------- do ---- | 260 | 259 | 321 |
| Diamond: | | | |
| Gem e ---------- thousand carats -- | 28 | 32 | 17 |
| Industrial e ---------- do ---- | 19 | 21 | 12 |
| Total [3] ---------- do ---- | 47 | 53 | 29 |
| Gold, mine output, metal content ---------- troy ounces -- | 4,026 | 7,551 | 12,239 |
| **PARAGUAY** | | | |
| Cement, hydraulic ---------- thousand metric tons -- | r 72 | 73 | 103 |
| Clays: | | | |
| Kaolin e ---------- metric tons -- | 4,000 | 8,000 | 12,000 |
| Other e ---------- thousand metric tons -- | 510 | 600 | 650 |
| Gypsum e ---------- metric tons -- | 11,000 | 10,500 | 14,600 |
| Lime ---------- do ---- | 24,263 | 25,476 | 26,700 |
| Petroleum refinery products: | | | |
| Gasoline ---------- thousand 42-gallon barrels -- | 527 | 569 | 431 |
| Jet fuel ---------- do ---- | 49 | 64 | 65 |
| Kerosine ---------- do ---- | 140 | 134 | 125 |
| Distillate fuel oil ---------- do ---- | 476 | 655 | 564 |
| Residual fuel oil ---------- do ---- | 253 | 437 | 462 |
| Other, liquefied petroleum gas ---------- do ---- | 34 | 89 | 75 |
| Refinery fuel and losses ---------- do ---- | 84 | 104 | 69 |
| Total ---------- do ---- | 1,563 | 2,052 | 1,791 |
| Pigments, natural mineral, ocher e ---------- metric tons -- | 60 | 90 | 110 |
| Sand, including glass sand e ---------- thousand metric tons -- | 451 | 541 | 601 |
| Stone: | | | |
| Dimension e ---------- do ---- | 72 | 87 | 97 |
| Crushed and broken: | | | |
| Limestone (for cement and lime) e ---------- do ---- | 146 | 143 | 180 |
| Other e ---------- do ---- | 1,320 | 1,400 | 1,520 |
| Talc, soapstone, and pyrophyllite e ---------- metric tons ---- | 220 | 250 | 250 |
| **SURINAM** | | | |
| Aluminum: | | | |
| Bauxite, gross weight ---------- thousand metric tons -- | 7,777 | 6,686 | 6,853 |
| Alumina ---------- do ---- | 1,380 | 1,380 | 1,185 |
| Metal, primary ---------- do ---- | 50 | 52 | 55 |
| Cement ---------- do ---- | 56 | r e 60 | e 65 |
| Clays, common e ---------- metric tons -- | 3,300 | 3,500 | NA |
| Gold, mine output, metal content ---------- troy ounces -- | 547 | 96 | e 100 |
| Sand and gravel: | | | |
| Sand: | | | |
| Common e ---------- thousand metric tons -- | 130 | 140 | NA |
| Stone sand ---------- do ---- | 13 | 13 | NA |
| Gravel ---------- do ---- | 210 | e 210 | NA |
| Stone, crushed and broken e ---------- do ---- | 150 | 150 | NA |
| **URUGUAY** | | | |
| Abrasives, natural corundum ---------- metric tons -- | -- | 304 | 332 |
| Aluminum, secondary ---------- do ---- | 40 | 35 | 42 |
| Barite ---------- do ---- | -- | -- | 17 |
| Cement, hydraulic ---------- thousand metric tons -- | 465 | 517 | 547 |
| Clays, type unspecified ---------- metric tons -- | 321,656 | 284,822 | 325,461 |
| Coke, gashouse ---------- do ---- | 13,565 | 13,236 | 13,419 |
| Feldspar ---------- do ---- | 971 | 205 | 1,757 |
| Fluorspar ---------- do ---- | r 81 | 96 | 211 |
| Gas, manufactured ---------- million cubic feet -- | 923 | 906 | 878 |
| Gem stones, semiprecious: | | | |
| Agate ---------- metric tons -- | 55 | 209 | 207 |
| Amethyst ---------- do ---- | -- | 44 | 51 |
| Gypsum ---------- do ---- | 47 | -- | -- |
| Iron and steel: | | | |
| Iron ore (for cement production) ---------- do ---- | 1,210 | 3,990 | -- |
| Steel, crude ---------- do ---- | r 350 | 350 | 192 |
| Steel, semimanufactures ---------- do ---- | r 45,200 | 49,762 | 38,381 |
| Lime ---------- thousand metric tons -- | e 50 | 48 | 46 |

See footnotes at end of table.

Table 1.—Other Areas of South America: Production of mineral commodities—Continued

| Area, commodity, and unit of measure | 1972 | 1973 | 1974 p |
|---|---|---|---|
| URUGUAY—Continued | | | |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels | 2,132 | 1,931 | 2,223 |
| Jet fuel ---- do | 170 | 135 | 143 |
| Kerosine ---- do | 1,382 | 1,453 | 1,377 |
| Distillate fuel oil ---- do | 2,470 | 2,869 | 2,530 |
| Residual fuel oil ---- do | 5,133 | 5,113 | 5,301 |
| Lubricants ---- do | 2 | 1 | 1 |
| Other: | | | |
| Liquefied petroleum gas ---- do | 295 | 291 | 637 |
| Unspecified ---- do | 178 | 134 | |
| Refinery fuel and losses ---- do | 181 | 201 | |
| Total ---- do | 11,943 | 12,128 | 12,212 |
| Sand and gravel: | | | |
| Sand: | | | |
| Common ---- thousand metric tons | 1,965 | 1,338 | 1,598 |
| Glass ---- do | 124 | -- | -- |
| Stone: | | | |
| Dimension ---- do | 32 | [4]17 | 19 |
| Crushed and broken: | | | |
| Alum schist ---- metric tons | 310 | -- | 84 |
| Dolomite ---- thousand metric tons | 19 | 24 | 19 |
| Limestone ---- do | e 880 | 900 | 1,090 |
| Marble ---- do | r 11 | 4 | 3 |
| Quartz ---- metric tons | 810 | 1,551 | 1,505 |
| Other (including ballast) -- thousand metric tons | 1,279 | 1,807 | 1,871 |
| Sulfur, elemental, byproduct [e 5] ---- metric tons | 114 | 116 | 120 |
| Talc, soapstone, and pyrophyllite ---- do | 1,323 | 1,997 | 2,075 |

e Estimate. p Preliminary. r Revised. NA Not available.

[1] In addition to the commodities listed a variety of crude construction materials (common clays, sand, gravel, and stone) undoubtedly is also produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[2] Less than ½ unit.

[3] Gem and industrial diamond production are estimated based upon a reported total production.

[4] In addition to this total, the Central Bank of Uruguay reported 63,161 cubic meters of granite as exports.

[5] Recovered from refinery gases.

## FRENCH GUIANA [2]

Only minimal quantities of minerals such as clay, gold, sand and gravel, and crushed stone were believed to have been produced in Guiana during 1974.

Kaw, Observatoire, and Isle de Cayenne are Guiana's bauxite concessions. Thus far, only Kaw has been thoroughly examined. Some development work has been done. Reserves are reportedly 42 million tons containing 47% alumina and 2% silica. Any bauxite production would probably be sent to Surinam for refining to alumina.

## GUYANA [3]

As in previous years bauxite was the major product of the nation's mineral industry. Some of this output was converted to alumina and calcined bauxite. The government-owned Guyana Bauxite Co., Ltd. provided about 80% of the nation's production of bauxite. Bauxite and alumina produced in Guyana was exported for the manufacture of refractories and for processing into aluminum metal. Guyana accounted for almost 4% of world bauxite production and 1% of world alumina production.

The remainder of the country's mineral production consisted of small quantities of gem and industrial diamond and gold.

The Government of Guyana enacted legislation on September 25, 1974, which increased the tax levy on bauxite production from $0.68 to $11.16 per ton. Subsequent negotiations by the Government of Guyana, Reynolds Metals Co. and the Overseas Private Investment Corp. (a U.S. Government agency) allowed an agreement to be prepared for the nationalization of

[2] Prepared by Benjamin Petkof, physical scientist Division of Nonferrous Metals.

[3] Prepared by Benjamin Petkof.

Reynolds properties in Guyana. The Guyana Government agreed to the payment of the approximate book value of the company or $14.5 million for its nationalized assets. Net compensation was reduced to $10 million because of settlement of claims between the Government of Guyana and Reynolds relating to income tax and bauxite production levies.

Complete nationalization occurred on January 1, 1975. With this action all bauxite activities within the country came under direct government control.

**Table 2.—Guyana: Exports and reexports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Alumina | 261,478 | 237,602 | U.S.S.R. 143,955; Hungary 55,383. |
| Bauxite: | | | |
| Dried refractory | 27,555 | 15,653 | United States 10,319; United Kingdom 3,770; West Germany 1,564. |
| Calcined | 661,589 | 674,601 | United States 239,532; United Kingdom 97,571; West Germany 70,914. |
| Other ---- thousand tons | 1,637 | 1,673 | Canada 683; United States 554; Virgin Islands 421. |
| Metal, semimanufactures | NA | 4 | Mainly to Brazil. |
| Copper metal including alloys, all forms | 3,774 | 97 | West Germany 40; United Kingdom 29; Canada 26. |
| Gold: | | | |
| Unrefined ---- troy ounces | NA | 1,297 | Canada 700; United Kingdom 447; Barbados 150. |
| Partly worked ---- value | NA | $2,717 | All to United Kingdom. |
| Iron and steel, semimanufactures | NA | 169 | NA. |
| Lead metal including alloys, all forms | NA | 109 | Trinidad and Tobago 75; United Kingdom 19; Netherlands 14. |
| Platinum-group metals -- troy ounces | NA | 75 | All to United Kingdom. |
| Other, nonferrous scrap metal | NA | 132 | Japan 59; United Kingdom 47; Trinidad and Tobago 15. |
| NONMETALS | | | |
| Clays and clay products (including all refractory brick) | NA | 1 | All to United Kingdom. |
| Precious and semiprecious stones value, thousands | $994 | $1,470 | Barbados $482; Netherlands $478; United Kingdom $233. |
| Salt | NA | (1) | NA. |
| Sand, not metal bearing | NA | 2 | Mainly to United Kingdom. |
| Sodium and potassium compounds, caustic soda | NA | (1) | NA. |
| Other crude nonmetallic minerals | NA | (1) | All to Surinam and St. Lucia. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coal | NA | 2 | All to Barbados. |
| Petroleum refinery products: | | | |
| Kerosine thousand 42-gallon barrels | NA | (1) | NA. |
| Residual fuel oil ---- do | NA | (1) | All to Trinidad and Tobago. |
| Lubricants ---- do | NA | (1) | Mainly to Trinidad and Tobago. |
| Liquefied petroleum gas -- value | NA | $2,674 | Do. |

NA Not available.
[1] Less than ½ unit.

## Table 3.—Guyana: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum: | | |
| Alumina | NA | 3 |
| Bauxite, gross weight | NA | 1,455 |
| Metal including alloys, all forms | 68 | 520 |
| Copper metal including alloys, all forms | NA | 85 |
| Gold metal, worked or partly worked ---- value | NA | $10,404 |
| Iron and steel including alloys, all forms | 40,621 | 32,173 |
| Lead metal including alloys, all forms | NA | 200 |
| Manganese ore ---- value | NA | $283 |
| Nickel metal including alloys, all forms | NA | 2 |
| Platinum-group metals, unworked and partly worked ---- troy ounces | NA | 1 |
| Silver metal, unworked and partly worked ---- do | NA | 10,797 |
| Tin metal including alloys, all forms ---- long tons | NA | 69 |
| Zinc metal including alloys, all forms | NA | 12 |
| Other: | | |
| Ore and concentrate, gross weight | NA | 31 |
| Metal including alloys, all forms, n.e.s | NA | 6 |
| **NONMETALS** | | |
| Abrasives: | | |
| Crude, natural | NA | 4 |
| Grinding and polishing wheels and stones | NA | 28 |
| Asbestos | NA | 9 |
| Cement | 70,774 | 39,140 |
| Clays and clay products (including all refractory brick): | | |
| Clays | NA | 11 |
| Clay products | 3,046 | 2,734 |
| Fertilizer materials: | | |
| Crude, phosphatic | NA | 47 |
| Manufactured: | | |
| Nitrogenous | 29,144 | 31,035 |
| Phosphatic | 8,469 | 7,795 |
| Potassic | -- | 2,676 |
| Other, including mixed | NA | 658 |
| Graphite, natural | NA | 9 |
| Lime ---- value, thousands | $297 | $891 |
| Mica, worked | NA | 19 |
| Pigments, mineral, including processed iron oxides | 429 | 410 |
| Precious and semiprecious stones ---- value | -- | $7,170 |
| Salt | 3,236 | 2,483 |
| Sodium and potassium compounds, caustic soda | 21,136 | 28,680 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude | NA | 1 |
| Worked | NA | 24 |
| Other stone | NA | 981 |
| Gravel and crushed stone | NA | 21 |
| Sand, not metal bearing | NA | 15 |
| Sulfur: | | |
| Elemental | NA | 2 |
| Sulfuric acid | -- | 1,002 |
| Other crude minerals | NA | 4,175 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Asphalt, natural | NA | $67 |
| Coal | NA | 24 |
| Coke | NA | 33 |
| Petroleum: | | |
| Crude ---- thousand 42-gallon barrels | -- | (1) |
| Refinery products: | | |
| Gasoline ---- do | 325 | 490 |
| Kerosine and jet fuel ---- do | 247 | 151 |
| Distillate fuel oil ---- do | 517 | 1,142 |
| Residual fuel oil ---- do | 2,459 | 2,296 |
| Lubricants ---- do | 30 | 37 |
| Other: | | |
| Liquefied petroleum gas ---- do | (2) | (2) |
| Mineral jelly and wax ---- do | -- | 1 |
| Asphalt ---- do | 94 | 19 |
| Unspecified ---- do | -- | (1) |
| Total ---- do | 3,672 | 4,136 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | NA | 37 |

NA Not available.
[1] Less than ½ unit.
[2] Quantity not available; imports were valued at $1,376,000 in 1972 and $338,000 in 1973.

## PARAGUAY [4]

Paraguay is a landlocked country of 157,000 square miles, bordered by Argentina, Bolivia, and Brazil. The economy is mainly pastoral. There are few developed mineral resources.

Mineral production was at record levels in 1974. The volume of production of nonmetals expanded 11% to 3.2 million tons. The value of nonmetals increased 49% to $14.5 million and the value of petroleum refinery products more than doubled to $54.2 million. New annual records were established for each nonmetallic mineral.

There were few mineral exports. Leading mineral imports were crude oil, iron and steel, salt, and asphalt.

Paraguay continued to develop the hydroelectric potential of the Parana and Paraguay Rivers. The $4 billion Itaipu project with Brazil will generate 12,600 megawatts, the world's largest. The Yacyreta-Apipe project with Argentina will generate 3,300 megawatts. Paraguay has reserved the right to sell or use its half of the power output. Plans were developed for construction of a diversion canal to handle the river during the construction of the Itaipu dam. The canal will cost more than $100 million. The completion of these hydroelectric projects in the mid-1980's could drastically transform the Paraguayan economy from an energy-short to an energy-exporting country.

### COMMODITY REVIEW

**Nonmetals.**—*Cement.*—Shipments of cement increased 39% to 103,000 tons and were 26% above the 1971 record. The new hydroelectric dams under construction will require large quantities of cement. Paraguay's share of the cement for the Itaipu dam will be 2 million tons. A new cement plant will be built in Paraguay by Argentina, Brazil, and Paraguay to supply cement for the Itaipu dam. The plant will cost $45 million and have a capacity of 250,000 tons per year. Each country will pay one-third of the total cost of the plant.

*Clays.*—Output of common clay for cement and heavy clay products increased 8% to a record 650,000 tons. Production of kaolin was a record 12,000 tons.

*Gypsum.*—Production of crude gypsum for cement expanded 39% and was 22% above the 1971 record.

*Lime.*—Output of lime increased 5% to a record 26,700 tons.

*Sand.*—Production of common sand was a record 600,000 tons, an increase of 11%. The Itaipu dam will require 5 million tons of sand from Paraguay.

*Stone.*—Output of crushed stone increased 10% to 1.7 million tons, 1% above the 1971 record. Most of the stone was used in cement. The new dams will require large quantities of stone.

**Mineral Fuels.**—*Petroleum.*—Paraguay has produced no crude petroleum and is completely dependent on imports. Crude oil was imported downriver from Bolivia and upriver from Argentina. Imports in 1974 were 230,000 tons, of which one-half came from Bolivia. A 10,000-barrel-per-day refinery at Asuncion is operated by Refineria Paraguaya S.A., which holds a refining monopoly.

An agreement was signed which grants to Exxon the right to explore an area of 3 million hectares along the border with Argentina.

*Refinery Products.*—Output of refinery products decreased 13% below the 1973 record to 1,791,000 barrels. Output of jet fuel was a record 65,000 barrels, but production of distillate fuel oil decreased 14%, kerosine 7%, liquefied petroleum gas (LPG) 16%, and motor gasoline 24%.

[4] Prepared by Avery H. Reed, supervisory physical scientist, Division of Nonmetallic Minerals.

Table 4.—Paraguay: Imports of mineral commodities [1]
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal, all forms | | 55 | 77 |
| Copper metal, all forms | | 630 | 797 |
| Iron and steel, all forms | | 17,934 | 25,512 |
| Lead metal, all forms | | 16 | 10 |
| Tin metal, all forms | long tons | 5 | 4 |
| NONMETALS | | | |
| Cement, hydraulic | | 881 | 1,060 |
| Salt | | 28,085 | 28,165 |
| Crude minerals and manufactures, not further described | | 4,462 | 5,845 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt, natural | | 741 | 2,791 |
| Coal, lignite, briquets and other solid fuels | | 46 | 37 |
| Petroleum: | | | |
| Crude oil | thousand 42-gallon barrels | 1,118 | 1,281 |
| Refinery products: | | | |
| Gasoline | do | r 103 | 55 |
| Kerosine | do | 9 | -- |
| Distillate fuel oil | do | 29 | 74 |
| Residual fuel oil | do | -- | 58 |
| Lubricants | do | 30 | 39 |
| Total | do | 171 | 226 |

r Revised.
[1] In addition to the commodities listed individually, Paraguay reports the importation of "precious stones and metals" totaling 12 metric tons in 1972 and 17 metric tons in 1973.

Source: Boletin Estadistico Mensual, January 1975.

## SURINAM [5]

Bauxite and products made from bauxite continued to be the principal export of Surinam and a major source of its foreign exchange. Surinam was the third largest bauxite-producing country in the world. An alumina plant located at Paranam was believed to be the second largest in the world.

Bauxite was mined by Surinam Aluminum Co. (Suralco), an Aluminum Co. of America (Alcoa) subsidiary, and Billiton Maatschappij Suriname, N.V. Suralco also produced alumina and aluminum and converted bauxite to alumina for Billiton. Exports of bauxite, most of which was shipped to the United States, increased 3% in 1974. Alumina exports declined 11% and went largely to Europe and the United States. Aluminum exports were virtually unchanged.

In March the Government of Surinam was represented at the organizational meeting of the International Bauxite Association (IBA). The announced objectives of IBA included the securing of fair and equitable returns from the exploitation of bauxite resources in member countries and the securing of effective national control over their bauxite industries. The Government officially ratified the statutes of IBA in October.

In December, Suralco and the Government of Surinam signed an interim agreement which would increase bauxite revenues paid to the Government to about $10 per ton retroactive to January 1, 1974. Previous revenues from bauxite have been estimated at $2.50 per ton. Under the agreement, which was effective through 1975, the new bauxite levy will be calculated on the basis of 6% of the average yearly price realized by Alcoa on unalloyed aluminum ingot.

Alcan Aluminum Ltd. and Billiton signed a joint venture agreement in July to establish a new company, Alcan Billiton Suriname N.V. (ABS), which will construct and operate a bauxite calcining plant at Smalkalden. The agreement gave the Surinam Government an option on one-third of the equity in the venture. Plant capacity was expected to be 150,000 tons per year of calcinated bauxite, and production was scheduled to begin in 1976.

[5] Prepared by Horace F. Kurtz, industry economist, Division of Nonferrous Metals.

Reynolds Metals Co., which had been exploring for bauxite in western Surinam under a joint venture with the Government, relinquished its concession and export rights. In acquiring full ownership of the venture, the Government agreed to compensate Reynolds $3.5 million.

Representatives of the Government and Placer Development Ltd. of Canada signed a joint-venture agreement for gold exploration and mining on a concession near the town of Brokopondo. The two parties will share equally in the venture to be known as Surplacer N.V.

An offshore oil exploration program to begin in 1975 was announced by the N.V. Elf Petroleum Suriname—Royal Dutch/Shell consortium which holds an offshore concession. Initial drilling will occur north of Coronie in 125 meters of water.

**Table 5.—Bauxite, alumina, and aluminum shipments from Surinam**
(Thousand metric tons)

| | 1973 | 1974 |
|---|---|---|
| **BAUXITE** | | |
| Suriname Aluminum Co.: | | |
| United States | 1,958 | 1,980 |
| Europe | 88 | 98 |
| Other | 3 | 7 |
| Total | 2,049 | 2,085 |
| N.V. Billiton Mij.: | | |
| United States | 1,067 | 1,234 |
| Canada | 543 | 333 |
| Other | 7 | 114 |
| Total | 1,617 | 1,681 |
| Grand Total | 3,666 | 3,766 |
| **ALUMINA** | | |
| Suriname Aluminum Co.: | | |
| United States | 239 | 260 |
| Europe | 455 | 320 |
| Other | 11 | -- |
| Total | 705 | 580 |
| N.V. Billiton Mij.: | | |
| United States | 90 | 155 |
| Netherlands | 259 | 264 |
| Other | 156 | 79 |
| Total | 505 | 498 |
| Grand total | 1,210 | 1,078 |
| **ALUMINUM** | | |
| Suriname Aluminum Co.: | | |
| United States | 7 | 12 |
| Europe | 35 | 28 |
| South America | 9 | 8 |
| Other | 3 | 7 |
| Total | 54 | 55 |

Table 6.—Surinam: Exports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 [1] |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite | 3,476,402 | [1]3,233,410 | United States 2,730,000; Canada 425,407. |
| Oxide (alumina) and hydroxide | 1,214,850 | 1,172,839 | United States 344,856; West Germany 282,721; Norway 267,755; Netherlands 207,497. |
| Metal including alloys, all forms | 49,930 | [1]21,938 | United States 11,120; Italy 6,545; 2,400. |
| Copper metal including alloys, all forms | 1,795 | 252 | All to West Germany. |
| Iron and steel, all forms | 2,385 | NA | |
| Lead including alloys, all forms | 150 | NA | |
| Magnesium | (2) | NA | |
| NONMETALS | | | |
| Sand, clays, earth | 2,360 | NA | |

NA Not available.
[1] Compiled from import statistics of selected trading partner countries.
[2] Less than ½ unit.

## URUGUAY [6]

Uruguay is a small country on the east coast of South America, between Argentina and Brazil. It has 72,000 square miles and 3 million people. It is mainly agricultural, with an economy based on wool and meat. There are few known mineral resources. There is little foreign trade in minerals.

Mineral output in 1974 increased 11% to 5.6 million tons of nonmetallic minerals. This was a new yearly record, 5% above the 1972 record. Total value of production increased 35% to $34.6 million but was 12% below the 1972 record. Output of petroleum refinery products increased 1% to 12.2 million barrels, a new record.

Lack of coal and oil resources makes it important to develop the hydroelectric potential. Planning continued on two large projects, the Salto Grande dam on the Uruguay River, a joint $500 million project with Argentina; and the El Palmar dam on the Negro River.

### COMMODITY REVIEW

Cement shipments increased 6% above the 1973 record to 547,000 tons. Clay output increased 14% to 325,500 tons per year, a new record. Output of sand increased 19% to 1.6 million tons. Production of crushed stone increased 7% to 4.6 million tons, a new record.

Refinery output of residual fuel oil increased 4% to 5.3 million barrels. Production of distillate fuel oil decreased 12% to 2.5 million barrels. Sales of gasoline increased 15% to 2.2 million barrels. Use of kerosine decreased 5% to 1.4 million barrels.

A state refining monopoly, Administración Nacional de Combustibles, Alcohol y Portland (ANCAP), has operated a refinery at La Teja, outside Montevideo, since 1937. Current capacity is 49,000 barrels per day. Uruguay is entirely dependent on imports for its oil. In 1974, imports of crude oil were from Kuwait (46%), Nigeria (28%), Iran (20%), and Iraq (6%).

Interest in oil exploration continued. Chevron was awarded a contract to explore offshore, near Punta del Este.

[6] Prepared by Avery H. Reed.

# The Mineral Industry of Albania, Denmark (Including Greenland), Iceland, and Switzerland

By Staff, Bureau of Mines

## CONTENTS



## ALBANIA [1]

Albania's centrally planned agricultural economy continued its shift towards industrial expansion. As in other East European countries, Albania's production schedules were centrally coordinated and production targets were predetermined in principle by the 1971–75 national plan for economic development.

Economic growth of Albania is closely linked with the development of its significant mineral resources. Albania, in 1974, was the world's third largest producer of chromium ore. Production of other commodities which ranked lower in importance by world standards, but were nevertheless important to the country's economy, were nickeliferous iron ore, copper ore, blister copper, copper wire, crude oil, petroleum products, lignite, natural gas, natural asphalt, and cement.

Compared with 1973 figures, crude oil production, in thousand tons,[2] increased by 55; gasoline by 7; distillate fuel oil by 161; chromium ore by 104; blister copper by 0.42; nickeliferous iron ore by 19; and cement by 37. Natural gas production increased by 23 million cubic meters,[3] and electric power by 96 million kilowatt-hours. There were also increases in the output of coal and steel semimanufactures.

Despite impressive gains in mineral production as reported in the Albanian press, there have also been reports of failures to reach planned goals to supply industry's needs.

Expansion of the mineral industry was achieved through a combination of increased labor, capital, and productivity. There were about 70,000 persons employed in Albania's minerals or minerals-related industries. To ease the shortage of labor in industry, Albanian administrative workers and members of the armed forces had to contribute physical labor to the country's economy. Each year men and unmarried women had to contribute 30 days and married women and members of the police force, 15 days.[4]

As in other East European countries, Albanian trade unions are not wage-bargaining organizations, but function mainly as an avenue for increasing labor productivity and the fulfillment of planned work quotas.

In 1974, the People's Republic of China (PRC) continued to assist in the construction of several industrial projects. These were (1) the Elbasan Metallurgical Combine; (2) the Fierzë 500-megawatt hydroelectric powerplant; (3) the 1-million-ton-per-year Ballësh petroleum refinery; (4) the Burrel chromite concentrator and ferrochrome plant; (5) the Laç copper ore concentration plant; (6) the Fier urea plant; and (7) the Vlora polyvinylchloride plant.

[1] Prepared by Joseph B. Huvos, foreign mineral specialist, Division of Coal.
[2] One metric ton of Albanian crude oil = 6.672 U.S. barrels of 42 gallons.
[3] 1 cubic meter = 35.3145 cubic feet.
[4] Probleme Ekonomike (Tirana). No. 2, April–June 1975, p. 71.

Industrial projects commissioned during 1974 included the 250-megawatt Mao Tse Tung hydroelectric powerplant; the Elbasan-Prrenjas railroad; and the 220-kilovolt Elbasan-Fier; and Bistrice-Konispol electric power transmission lines.

Geological exploration and prospecting increased in 1974. The Gur i Kuq nickeliferous iron ore mine and the Valias coal mine were expanded.

Albania's Council of Ministers, by its decision No. 204 of October 23, 1973, ordered the establishment of quality control organizations during 1974–75.[5]

## PRODUCTION

Mineral production statistics were not officially reported for a number of commodities. Therefore, many of the data were estimated and represent at best an order of magnitude. Production capacity for almost all mineral commodities increased during the year.

Reportedly some 35 minerals were produced in the country in 1974. While output of most mineral industry commodities increased steadily, production goals were not reached in metals, nitrogenous fertilizers, cement, and oil drilling; in some instances there was no demand for the goods produced. The transportation industry failed to reach some targets in 1974.[6]

Construction of roads and railroads continued during 1974 and plans are to expand the domestic railroad network by 43% during the 1976–80 plan period. Of a total of 40.1 million tons of merchandise shipped in 1974 in Albania, 76.1% were transported by road; 21.6% by rail; and 2.3% by sea. About 5.7% of all investment funds in 1973 were spent in the country's transportation and communications industries.

[5] Gazeta Zyrtare (Tirana). No. 6, Dec. 30, 1973, p. 129.
[6] Zeri i Popullit (Tirana), Jan. 28, 1975, pp. 1–3.

**Table 1.—Other European Countries: Production of mineral commodities**

| Area, commodity, and unit of measure | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **ALBANIA [1]** | | | |
| Cement, hydraulic ---- thousand metric tons -- | e 525 | 518 | 555 |
| Chromium, chromite, gross weight ---- do ---- | r e 560 | 611 | 715 |
| Coal, lignite ---- do ---- | 740 | 811 | e 851 |
| Copper: | | | |
| Mine output, metal content [2] ---- metric tons -- | 6,320 | 7,000 | 7,420 |
| Smelter output (blister) ---- do ---- | 6,700 | 7,000 | 7,420 |
| Fertilizer materials, manufactured: | | | |
| Nitrogenous ----thousand metric tons -- | e 90 | 106 | e 110 |
| Phosphatic ---- do ---- | e 110 | 110 | e 110 |
| Gas, natural, gross production ---- million cubic feet -- | r 5,280 | 6,710 | e 7,170 |
| Iron and steel: | | | |
| Iron ore, nickeliferous, gross weight thousand metric tons -- | r e 400 | 384 | 403 |
| Semimanufactures (rolled angles, shapes and sections) metric tons -- | e 34,000 | 36,000 | e 38,000 |
| Petroleum: [3] | | | |
| Crude oil: | | | |
| As reported ---- thousand metric tons -- | r 2,150 | 2,200 | 2,255 |
| Converted ---- thousand 42-gallon barrels -- | r 14,345 | 14,678 | 15,045 |
| Refinery products: | | | |
| Gasoline ---- do ---- | e 835 | 774 | 833 |
| Kerosine and jet fuel ---- do ---- | e 175 | e 124 | 2,499 |
| Distillate fuel oil ---- do ---- | e 1,210 | 1,298 | NA |
| Residual fuel oil ---- do ---- | e 2,165 | 2,085 | NA |
| Lubricants ---- do ---- | e 50 | 42 | NA |
| Other: | | | |
| Petroleum wax and jelly ---- do ---- | e 130 | 275 | NA |
| Asphalt and bitumen ---- do ---- | e 4,890 | 5,890 | NA |
| Petroleum coke ---- do ---- | e 35 | 28 | NA |
| Unspecified ---- do ---- | e 345 | -- | 8,925 |
| Total ---- do ---- | e 9,835 | 10,516 | e 12,257 |
| Salt [e] ---- metric tons -- | 50,000 | 50,000 | 50,000 |
| Sodium carbonate, calcined ---- do ---- | e 18,000 | 21,000 | e 22,000 |
| **DENMARK [1]** | | | |
| Cement, hydraulic [4] ---- thousand metric tons -- | 2,873 | 2,888 | 2,492 |
| Clays, kaolin, crude and washed [e] ---- metric tons -- | 18,000 | 18,000 | 18,000 |
| Coke, gashouse ---- thousand metric tons -- | 150 | 83 | e 83 |

See footnotes at end of table.

## Table 1.—Other European Countries: Production of mineral commodities—Continued

| Area, commodity, and unit of measure | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **DENMARK [1]—Continued** | | | |
| Diatomaceous materials: | | | |
| Diatomite [e] ---- thousand metric tons | 20 | 20 | 20 |
| Moler [e] ---- do | r 220 | r 220 | 220 |
| Fertilizer materials, manufactured: [4] | | | |
| Nitrogenous, gross weight ---- do | 95 | 79 | 68 |
| Phosphatic, gross weight ---- do | r 611 | 642 | 641 |
| Mixed and unspecified, gross weight ---- do | 242 | 297 | 244 |
| Iron and steel: | | | |
| Iron ore (less than 42% iron), gross weight ---- do | 15 | 10 | 6 |
| Pig iron and blast furnace ferroalloys ---- do | 203 | 76 | -- |
| Crude steel [5] ---- do | 498 | 449 | 535 |
| Steel semimanufactures ---- do | 423 | 391 | 478 |
| Lead metal, secondary (including alloys) [4] ---- do | r 9 | 9 | 15 |
| Lime (quicklime and agricultural) [4] ---- do | 199 | 217 | 171 |
| Peat fuel [e] ---- do | 5 | 5 | 5 |
| Petroleum: | | | |
| Crude ---- thousand 42-gallon barrels | 622 | 1,460 | 689 |
| Refinery products: | | | |
| Gasoline ---- do | 12,087 | 14,800 | 13,599 |
| Jet fuel ---- do | 488 | 107 | 119 |
| Kerosine ---- do | 868 | 994 | 663 |
| Distillate fuel oil ---- do | 25,237 | 28,519 | 24,287 |
| Residual fuel oil ---- do | 27,772 | 24,179 | 20,412 |
| Lubricants ---- do | -- | -- | 32 |
| Other ---- do | 4,749 | 4,899 | 3,757 |
| Refinery fuel and losses ---- do | 3,609 | 3,738 | 3,206 |
| Total ---- do | 74,810 | 77,236 | 66,075 |
| Salt [4] ---- thousand metric tons | 306 | 368 | 423 |
| **GREENLAND [1]** | | | |
| Lead, mine output, metal content ---- metric tons | -- | 5,700 | 24,100 |
| Zinc, mine output, metal content ---- do | -- | 27,200 | 88,500 |
| **ICELAND** | | | |
| Aluminum smelter production, primary ---- do | 45,560 | 72,000 | 69,600 |
| Cement, hydraulic ---- thousand metric tons | 130 | 134 | 101 |
| Diatomite ---- metric tons | 22,000 | 22,300 | e 22,500 |
| Fertilizer materials, manufactured, nitrogenous: | | | |
| Gross weight ---- do | e 27,500 | e 30,000 | 35,270 |
| Nitrogen content [7] ---- do | r 3,217 | 3,507 | 4,476 |
| Pumice ---- do | e 17,217 | 19,000 | e 6,930 |
| Sand and gravel: | | | |
| Calcareous ---- thousand cubic meters | 127 | 119 | 119 |
| Other sand and gravel ---- thousand metric tons | 5,300 | 5,800 | 561 |
| Stone: | | | |
| Dimension ---- do | 82 | 86 | NA |
| Crushed and broken ---- do | 400 | 432 | NA |
| Scoria ---- do | 10 | 10 | NA |
| **MALTA** | | | |
| Lime ---- do | 59 | 32 | NA |
| Limestone ---- thousand cubic meters | 237 | 746 | NA |
| Salt ---- metric tons | r 446 | 2,897 | e 3,000 |
| **SWITZERLAND [1]** | | | |
| Aluminum smelter production, primary ---- do | 83,638 | 85,367 | 87,157 |
| Cement, hydraulic ---- thousand metric tons | 5,713 | 5,756 | 5,253 |
| Coke, gashouse ---- do | 91 | 100 | 30 |
| Gas, manufactured ---- million cubic feet | 14,060 | 14,854 | 10,282 |
| Gypsum [e] ---- thousand metric tons | 100 | 100 | 100 |
| Iron and steel: | | | |
| Pig iron and blast furnace ferroalloys ---- do | r 28 | 26 | 35 |
| Electric furnace ferroalloys ---- do | e 21 | -- | NA |
| Crude steel ---- do | 543 | 584 | 593 |
| Steel semimanufactures ---- do | r 608 | 649 | 605 |
| Lime ---- do | 150 | 138 | 113 |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels | 6,282 | 7,854 | 8,284 |
| Jet fuel ---- do | 920 | 992 | 1,168 |
| Kerosine ---- do | 23 | 31 | 31 |
| Distillate fuel oil ---- do | 16,792 | 17,725 | 18,195 |
| Residual fuel oil ---- do | 10,803 | 13,646 | 11,102 |
| Other ---- do | 2,735 | 3,158 | 3,306 |

See footnotes at end of table.

**Table 1.—Other European Countries: Production of mineral commodities—Continued**

| Area, commodity, and unit of measure | 1972 | 1973 | 1974 p |
|---|---|---|---|
| SWITZERLAND [1]—Continued | | | |
| Petroleum refinery products—Continued | | | |
| Refinery fuel and losses ---------- thousand 42-gallon barrels -- | 3,000 | 1,587 | 2,365 |
| Total ---------- do ---- | 40,555 | 44,993 | 44,451 |
| Salt ---------- thousand metric tons -- | 256 | 299 | 300 |

e Estimate. p Preliminary. r Revised. NA Not available.

[1] In addition to the commodities listed, a variety of crude construction materials (common clay, sand, gravel, and stone) is undoubtedly produced, but output is unreported and available general information is inadequate to make reliable estimates of output levels.

[2] Smelter output used as an estimate of mine output inasmuch as there is no evidence of ore and/or concentrate exports.

[3] Petroleum data converted to barrels from metric tons using the following factors: Crude petroleum—6.672; gasoline—8.50; kerosine and jet fuel—7.75; distillate fuel oil—7.46; residual fuel oil—6.66; lubricants—7.00; petroleum wax and jelly—7.87; asphalt and bitumen—6.06; petroleum coke—5.50; unspecified—7.00. The tonnage figures for "unspecified" were derived by subtracting the tonnages for individual products reported from a reported total refinery product figure, which may have excluded refinery fuel.

[4] Sales.

[5] Excludes shipyards production of crude castings.

[6] May include small amounts of other fertilizers.

[7] Calculated on the basis of 11.7% contained nitrogen in total quantity fertilizer reported on preceding line.

[8] Exports.

## TRADE

In Albania's mineral economy, international trade ranks high among industry's priorities. Since the volume of trade is outlined in the national 5-year plan and is conducted by the Ministry of Foreign Trade, planned exports and imports reflect national goals and priorities. There is also an implied commitment to export to achieve the desired trade balance.

Albania's foreign trade continued to be oriented towards the importation of capital goods to increase Albania's self-sufficiency. Exports of minerals and semiproducts helped to pay for these imports. The sale of minerals and their products was carried out largely under bilateral trade agreements negotiated on a State-to-State basis.

In 1973, Albania reported exports of crude oil, bituminous flux, nickeliferous iron ore, chromium ore, blister copper, electrolytic copper, copper wire, and six products of the light or food industries. Other exports not reported included chromium concentrate; rolled steel; electric wire and cables; sulfuric acid and pyrite; soda ash; sodium hyposulphite; selenium; cement; silica brick; marble; and electric power.

Data in the trade tables were compiled from trade returns of trading partner countries, as reported in the World Trade Annual of the United Nations.

It was reported that the Nation's trade volume (exports and imports) reached the 1971–75 plan target 2 years ahead of schedule. The increase in the 1974 trade volume was 11.7% compared with 1973 and 86% compared with 1970. Reportedly, in 1974, Albania exported 350 commodities which included 62% processed goods and mineral products.

Among Albania's trading partners the PRC ranked first with an estimated $245 million, or 70% of all trade (exports and imports) in 1974, and there was a large surplus in favor of the PRC resulting from deliveries under aid credits. Albania had bilateral trade agreements with Yugoslavia, Italy, Austria, Malta, the Sudan, the United States, and the East European countries.

In 1974, U.S. imports from Albania were valued at $483,900 and included $218,144 worth of chromium ore. U.S. exports to Albania were valued at $485,000.

## Table 2.—Albania: Exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Chromite [2 3 4] ---------- thousand tons -- | 173 | 466 | Yugoslavia 115; Italy 67; Poland 36. |
| Copper metal: | | | |
| Blister and refined, unwrought [2 3] --- | r 820 | 2,016 | Italy 598. |
| Semimanufactures [2 3] ---------- | r 378 | 2,481 | West Germany 276; Yugoslavia 55. |
| Iron and steel: | | | |
| Ore, nickeliferous, gross weight [2] thousand tons -- | NA | 318 | NA. |
| Scrap ---------- | 2,504 | 4,000 | All to Italy. |
| Silver, waste and sweepings, value, thousands -- | $120 | $158 | Do. |
| Tin including alloys, unwrought long tons -- | 10 | NA. | |
| NONMETALS | | | |
| Clays and clay products, nonrefractory -- | 23,163 | 28,333 | All to Yugoslavia. |
| Fertilizer materials, manufactured nitrogenous ---------- | 3,166 | NA | |
| Stone, dimension, calcareous ---------- | 928 | 1,560 | All to Italy. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural ---------- | 2,683 | NA | |
| Coal, excluding briquets ---------- | NA | 744 | All to Yugoslavia. |
| Coke ---------- | NA | 1,900 | Do. |
| Petroleum: | | | |
| Crude [2] thousand 42-gallon barrels -- | 15 | 2,749 | Italy 631; Greece 162. |
| Refinery products: | | | |
| Bitumen ---------- do ---- | 1,051 | 1,302 | Italy 537; Greece 447; Yugoslavia 318. |
| Bitumen and mixtures [2 3] do ---- | 407 | 5,860 | Romania 286. |
| Unspecified [4] ---------- do ---- | 5 | 1 | All to Poland. |

r Revised. NA Not available.

[1] Compiled from the trade returns of trading partner countries as reported by the Statistical Office of the United Nations in the 1972 Supplement to the World Trade Annual, Walker and Company, New York, 1974, and in vs. 1, 2, and 3 of the World Trade Annual, 1973, Walker and Company, New York, 1975, unless otherwise specified.

[2] Source: Official Albanian trade statistics.

[3] Source: Official Romanian trade statistics.

[4] Source: Official Polish trade statistics.

## Table 3.—Albania: Imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, all forms ---------- | 573 | 575 | Yugoslavia 307; Greece 204; West Germany 64. |
| Pig iron, including cast iron and ferroalloys [2] ---------- | 4,041 | 4,562 | All from Poland. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, and sections [2 3] ---------- | 5,749 | 30,300 | Czechoslovakia 26,000. |
| Universals, plates, and sheets [2 3 4] ---------- | r 32,707 | 58,810 | Poland 20,700; Czechoslovakia 14,400. |
| Wire [3] ---------- | 18 | 20 | All from Sweden. |
| Tubes, pipes, and fittings [2 5] ---- | r 6,007 | 10,452 | Italy 5,406; Yugoslavia 2,635; Romania 1,400. |
| Hoop and strip [3] ---------- | NA | 400 | All from Poland. |
| Rails and accessories [3] --------- | NA | 600 | Czechoslovakia 500; Poland 100. |
| Zinc ---------- value, thousands -- | $30 | NA | |
| Other nonferrous metals, n.e.s -- do ---- | r $40 | $79 | Yugoslavia $74. |
| NONMETALS | | | |
| Asbestos, crude ---------- | 726 | 543 | All from Yugoslavia. |
| Barite and witherite ---------- | 1,222 | NA | |
| Clays and clay products: | | | |
| Refractory ---------- | 1,918 | 1,088 | All from Yugoslavia. |
| Other ---------- | 58 | 34 | Do. |
| Sodium and potassium compounds, caustic soda ---------- | NA | 1,000 | Do. |
| Other crude nonmetals, n.e.s. value, thousands -- | r $6 | $29 | Do. |

See footnotes at end of table.

Table 3.—Albania: Imports of selected mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Coke [2] thousand tons | 20 | 20 | All from Poland. |
| Petroleum refinery products: | | | |
| Kerosine [5] thousand 42-gallon barrels | 4 | NA | |
| Distillate and residual fuel oils [e 6] do | 141 | 141 | NA. |
| Lubricants do | 4 | 3 | All from Greece. |
| Other, unspecified [5] do | 11 | 22 | All from Romania. |

e Estimate. r Revised. NA Not available.
[1] Compiled from trade returns of trading partner countries, as reported by the statistical office of the United Nations in the 1972 Supplement to the World Trade Annual, Walker and Company, New York, and in vs. 1, 2, and 3 of the World Trade Annual, 1973, Walker and Company, New York, unless otherwise specified.
[2] Source: Official Polish trade statistics.
[3] Source: Statistics of World Trade in Steel, 1973, United Nations, New York, 1974.
[4] Source: Official Hungarian Trade Statistics.
[5] Source: Official Romanian Trade Statistics.
[6] Source: World Energy Supplies 1970–73, United Nations, New York, 1975.

## COMMODITY REVIEW

**Metals.**—Output of metals lagged behind goals as foreseen by the 5-year plan of 1971–75. The production of ores and metals, however, continued to grow and reportedly reached or exceeded the revised plan targets for 1974.

The production of bauxite, manganese ore, lead, zinc, and pyrite concentrate was not reported and available data were not adequate to make reliable estimates of output levels.

*Chromium Ore.*—Albania was the world's third largest producer of chromium ore in 1974 with 9.8% of the world's total production following the U.S.S.R. and the Republic of South Africa. Output from Albania's seven chromium mines reached an estimated 715,000 tons, 104,000 tons more than in 1973. The original 5-year plan called for the production of 900,000 tons of ore in 1975, but the revised plan target for 1974 was 837,000 tons.[7] Chromium ore was Albania's leading export product. In 1973, the country exported 466,000 tons of ore 18,000 tons less than in 1971; exports included 36,254 tons to Poland and 30,000 tons to Romania. The 1974 exports of chromium ore included 104,300 tons to Yugoslavia, 40,945 tons to Italy; 10,035 tons to Hungary; and about 3,000 tons to the United States. The average grade of the chromium ore exported increased from 22.8% $Cr_2O_3$ content in 1960 to 36.5% in 1973. Albania's main chromium mining area is near Batër-Martanesh located 40 kilometers northeast of Tirana in the Mat Valley. The Todo Manco mine in this area was the country's largest,[8] and was equipped with a 200,000-ton-per-year ore beneficiation plant. A smaller mine was located at Zerqan.

Albania's second chrome mining center is in the north near Kam and Kalimash, where a beneficiation plant is to be built during 1976–80. About 25% of the country's chromium ore was processed in 1974. In 1973 the mined ores had an average content of 37.5% $Cr_2O_3$, 13% FeO, and 22% $Al_2O_3$. Concentrates exported in 1974 had a $Cr_2O_3$ content of 41% to 46%. In 1974, with the assistance of the PRC, construction started on the Burrel, Mat District ferrochromium plant which is to supply the Elbasan Metallurgical Combine.

*Copper.*—Albania's blister copper production reached an estimated 7,420 tons in 1974, an increase of 6% over that of 1973. Exports included 2,016 tons of blister and 2,481 tons of copper wire in 1973. While all copper produced in 1965 was exported as blister, about 60% of the copper production in 1975 is to be converted into wire and the remainder into various products such as refined metal, bronze, and brass.[9] Albania's copper mines are in the north. The largest mine is at Gjegjan near the Yugoslav border. The copper concentrates were processed at the Kukës smelter. Another smelter with an electroyltical refinery is located at Rubik. Construction of a large smelter and electrolytical refinery continued at Laç during 1974. When the plant is completed, it will process copper concentrates from the Rubik mine.

The average recoverable copper content of Albanian ores was 1.9% in 1970.

[7] Pages 1–5 of work cited in footnote 6.
[8] Probleme Ekonomike (Tirana), Nos. 5–6, May–June 1974, pp. 3–22.
[9] Work cited in footnote 8.

Copper wire is produced at Shkodër at a plant built with the assistance of the PRC. It was reported that the excess capacity of the mill is to be used for processing imported aluminum ingots.

*Iron Ore, Nickeliferous.*—Production was about 403,000 tons in 1974, an increase of 5% compared with that of 1973. The production target for 1975 was set at 650,000 tons. Exports totaled 318,000 tons in 1973, 72,000 tons less than in 1970. The most important nickeliferous iron ore mines are near Lake Ohrid at Pishkash and Prenjas, Poradec County. The ore is mined in open pits and averaged about 1% nickel. It also contained some cobalt. In 1974, the ore was exported, but in 1975 it is to be used domestically at the Elbasan Metallurgical Combine.

The Elbasan Metallurgical Combine is one of Albania's largest investment projects. The PRC assisted in the plant construction which started in 1971. Pig iron production is to start in 1975. According to plans, the output of all products is to total 800,000 tons per year in 1980 and will include wire, sheets, profiles, bars, and ingots.[10] The plant facilities are to include kiln prereduction of ores followed by smelting in electric arc furnaces. There are also plans to recover the nickel and cobalt from the ores separately at some later date. The rolling and fabricating plants of the combine had been completed in 1970 and are used to process steel into various rolled products. The total output of rolled metal at this plant was about 38,000 tons in 1974, an increase of 5.6% over that of 1973. A railroad for transporting iron ore from the mines in Prenjas to the Elbasan Metallurgical Combine was completed in 1974 and there are plans to extend the railroad to Struga, Yugoslavia.

**Nonmetals.**—In 1974, Albania reported production of cement, nitrogenous and phosphatic fertilizer, soda ash, caustic soda, and unspecified quantities of asbestos, kaolin, dolomite, gypsum, lime, limestone, marble, olivine, quartzite, selenium, silica, sulfur, sulfuric acid, and volcanic glass. Albania did not release data on imports of nonmetals, but Yugoslavia reported exports of 100 tons of talc, 380 tons of sulfur, 600 tons of barite, and 41 tons of bentonite to Albania in 1973.

*Cement.*—The output of cement reached an estimated 555,000 tons in 1974, an increase of 7.1% over that of 1973. Cement production is to reach 1 million tons in 1975. Reportedly some cement was exported in 1974, but no precise data were available. Albania's cement plants are at Elbasan and Fusë – Krujë.

*Fertilizer Materials.*—The output of nitrogen fertilizer was about 110,250 tons, an increase of 4% over that of 1973. A revised production target for nitrogen fertilizer in 1975 was an estimated 200,000 tons. The published production target for nitrogen and phosphatic fertilizer for 1975 was 330,000 tons. Albania's only nitrogenous fertilizer plant was built at Fier with the assistance of the PRC. Output in 1974 included about 50,000 tons of ammonia and unspecified amounts of ammonium nitrate. Construction continued on a urea plant also at Fier, which is to double Albania's nitrogen fertilizer production. The total output of phosphatic fertilizer, including granulated and powdered superphosphate, was 110,000 tons, unchanged as compared with that of 1973. Phosphate rock was supplied by Morocco in 1974.

Construction of the PRC assisted Laç fertilizer plant, the only one in Albania, was completed in 1967. The plant included facilities for production of sulfuric acid; sodium silico-fluoride; sulfates of aluminum, ammonium, chromium, copper, magnesium, and sodium. Raw materials used were imported native sulfur and some domestic pyrite concentrate.

*Sodium Compounds.*—The production of sodium carbonate at the Vlorë caustic soda plant was about 22,000 tons, a 4.8% increase over that of 1973. Construction continued on a second sodium carbonate plant at Vlorë, which would double present production. Caustic soda output in 1973 was 18,000 tons. Marine salt used as a raw material in the plant was replaced in 1974 by rock salt from Delvinë, Sarandë County.[11] Estimated production of rock salt was 50,000 tons in 1974, unchanged as compared with that of 1973.

**Mineral Fuels.**—Albania's estimated production of primary energy from fossil fuels and hydroelectric sources increased from 3.56 million tons of standard fuel equivalent in 1973 to 3.81 million tons in 1974. Estimated output of crude oil increased from 2.2 million to 2.3 million tons and that of natural gas from 190 million to 203 million cubic meters. The share of these

[10] Work cited in footnote 8.
[11] Zeri i Popullit (Tirana), July 14, 1974, p. 3.

fuels in Albania's primary energy supply increased correspondingly from 73.8% in 1973 to 74.8% in 1974. In 1974 Albania produced an estimated 851,000 tons of lignite coal. The share of lignite in the primary energy supply decreased from 21.3% in 1973 to 21.0% in 1974. The share of hydroelectric power decreased from 4.9% to 4.2% during the same period. The trend in Albania's energy was towards an increase in the output of all energy carriers, the elimination of imports of high rank coal and of petroleum products, and the export of surplus fuels and energy.

In 1974 Albania produced an estimated 1,699 million kilowatt-hours of electricity, 6.0% more than in 1973. Thermal powerplants generated 485 million kilowatt-hours of electricity (28.6%) and hydroelectric powerplants 1,213 million kilowatt-hours (71.4%). Installed capacity of electric powerplants at yearend totaled 467,000 kilowatts.

Albanian industry consumed about 72% of the fossil fuels and 9% of the electric energy produced.

Total energy balances of Albania for 1973 and 1974 are shown in table 4.

**Table 4.—Albania: Primary energy balance for 1973 and 1974**
(Million tons of standard fuel equivalent)

| Year | Total primary energy | Coal (lignite) | Crude oil and petroleum products | Natural and associated gas | Hydroelectric power |
|---|---|---|---|---|---|
| 1973: [1] | | | | | |
| Production | 3.56 | 0.46 | 2.73 | 0.23 | 0.14 |
| Imports | 0.02 | .02 | -- | -- | -- |
| Exports | 1.33 | -- | 1.30 | -- | .03 |
| Apparent consumption | 2.25 | .48 | 1.43 | .23 | .11 |
| 1974: [2] | | | | | |
| Production | 3.81 | .48 | 2.93 | .25 | .15 |
| Imports | .02 | .02 | -- | -- | -- |
| Exports | 1.45 | -- | 1.40 | -- | .05 |
| Apparent consumption | 2.38 | .50 | 1.53 | .25 | .10 |

[1] Production and trade data for 1973 taken from Thirty Years of Socialist Albania (Tirana) 1974.
[2] Production and trade data for 1974 reported in Zeri i Popullit (Tirana), Jan. 28, 1975, pp. 1–3, and in other Albanian sources; export trade was taken from trade returns of Albania's trading partner countries.

*Coal (Lignite).*—Lignite production was estimated at 851,000 tons, an increase of 40,000 tons over that of 1973. According to the 5-year plan of 1971–75, the coal production target for 1975 was 1.25 million tons, but the revised plan calls only for 0.894 million tons, or 5% over that of 1974. Albania also imported an estimated 20,000 tons of bituminous coal and coke in 1974 and exported unspecified quantities of lignite during the same year. The calorific value of the lignite mined in Albania was about 4,900 kilocalories per kilogram (8,800 Btu per pound). Albania's largest lignite deposits are near Korcë; the mines are at Mborjë, Drenovë, and Memaliaj in Tepelenë County. Reportedly there was also a coal preparation plant near these mines. In the Tirana area the mines are at Krrabë and Manezë.

*Natural Gas.*—In 1974 Albania produced an estimated 203 million cubic meters of natural gas, 6.8% over 1973 production. According to the original 5-year plan of 1971–75, the 1975 natural gas production target was 255 million cubic meters, but the revised plan for 1975 envisages a target of about 300 million cubic meters.

Albania's gasfields are located in the same area as its oilfields. Reportedly, estimated gas resources were 227 billion cubic meters in 1974.[12] Natural gas was used in the petrochemical industry, thermal power generation and the domestic sector. There are plans to extend Albania's gas pipelines to all major cities by 1980.

*Petroleum.*—Crude oil output in 1974 was 2.255 million tons, 3% more than that of 1973; the production target for 1975 is 2.7 million tons. Exports of crude oil in 1974 amounted to about 441,000 tons and those of bituminous flux about 1,035,000 tons. Several petroleum products which are not produced in the country were im-

[12] Petroleum Publishing Co. International Petroleum Encyclopedia. Tulsa, Okla., 1975.

ported from Italy, Yugoslavia, and Hungary.

Albania's oilfields are at Patos, Marinezë, and Stalin. The crude oil produced had an average specific gravity of 0.8, yielded about 13% gasoline and 40% asphalt, and contained 3% sulfur. Estimated refining capacity in 1974 was 2 million tons, of which 1 million tons was located at Fier and 500,000 tons each at the Stalin and Cerrik installations. Construction continued at the Ballësh 1-million-ton-per-year refinery in 1974. The refinery, built with PRC assistance, is to be equipped with catalytic processing units making Albania independent of imports of petroleum products and is to provide petrochemical feedstock to the country's petrochemical industry such as the polyvinylchloride plant under construction in Vlorë. Albania's oil pipeline system connects the seaport of Vlorë to the country's oilfields and refineries. Construction of a railroad connecting Fier to the Ballësh refinery continued in 1974.

*Electric Energy.*—In the overall energy economy of Albania, hydroelectric power was of major importance. In 1974, hydroelectric powerplants supplied 1,213 million kilowatt-hours, or 71.4% of all electric power generated. At yearend 1974, total capacity of all electric powerplants reached 467,000 kilowatts, of which the capacity of hydroelectric powerplants totaled 325,000 kilowatts.[13] Exports of hydroelectric energy included 364 million kilowatt-hours to Yugoslavia[14] and unspecified amounts to Greece.

In 1974, the following hydroelectric powerplants were in operation: the 5,000-kilowatt "Lenin" and the 20,000-kilowatt "Stalin" powerplants, both on the Bistricë River; the 25,000-kilowatt "Engels"; an unnamed 25,000-kilowatt plant on the Matë River; and the 250,000-kilowatt Mao Tse Tung powerplant, commissioned in 1974, on the Drini River. Construction of the 500,000-kilowatt Fierzë powerplant, also on the Drini River, was continued in 1974. The 200,000-volt Fier-Elbasan and the Bistricë – Konispol powerline was completed in 1974.[15]

## DENMARK (INCLUDING GREENLAND)[16]

A 20% increase in production by the scrap-based iron and steel industry was one of the most favorable developments in the Danish minerals industry in 1974. The increase in steel output was almost solely attributable to Det Danske Staalvalsevaerk A/S (DDS), which continued a program of plant expansion. Also encouraging was the first full year of operations at the Black Angel mine for lead and zinc in Greenland, where exploration for additional mineralization progressed. Construction-oriented nonmetallic minerals did not fare well, as evidenced by declines in sales of cement and in exports of stone, sand, and gravel. No significant production of crude oil was yet achieved. However, exploration and development activity went forward at the Dan Field in the North Sea, and bids were received for oil drilling off western Greenland.

The national economy entered an uncertain period.[17] Domestic demand began falling in 1974, and thus exports became the strongest demand factor. Construction activity declined severely; unemployment rose and was approaching 5% at yearend. Prices increased substantially. Raw materials prices increased 132% for all fuels; 108% for fuel oils; 34% for iron and steel; 30% for other industries; and 61% overall. The consumer price index was 15% higher. Rate of growth of domestic product decreased to about 2% as compared with 4% in 1973. The deficit in the balance of payments about doubled, and the trade deficit for mineral commodities increased markedly as anticipated in view of petroleum price increases.

### PRODUCTION

There continued to be no primary, only secondary production of metals in Denmark. The only metallic ore mining was for lead-zinc ore in Greenland, and this ore was shipped mainly to other European countries for smelting. The main nonmetallic materials mined were chiefly for construction and agricultural purposes: Sand and gravel, stone, chalk (mostly for cement manufacture), and limestone. Detailed mineral production data are not

[13] Bashkimi (Tirana), Nov. 22, 1974, p. 2.
[14] Foreign Trade of Yugoslavia (Belgrade), 1975.
[15] Ylli (Tirana), June 1975, p. 30.
[16] Prepared by Thomas S. Jones, physical scientist, Division of Ferrous Metals.
[17] Danmarks Statistik (Copenhagen). Statistiske Efterretninger, Konjunkturoversigt, December 1974, pp. 51–53; April 1975, 119 pp.

available, but physical output may be inferred roughly from sales data. Sales data, with distortions for inflated petroleum prices, generally paralleled the employment pattern (index of man-hours worked, wage earners only), which in 1974 showed the following changes relative to 1973: Basic metal industries, +14%; fabricated metal products, +3%; chemicals and chemical products, −3%; nonmetal mineral products, −7%; mining and quarrying, −15%; and all industries, −3%.

Thus 1974 was a year in which steel production was strong, about 20% greater than in 1973, and the nonferrous metal industries did about as well as in the year previous, with production of refined pig lead up 11%. Crude oil output from the North Sea was still negligible in relation to domestic demand; refinery throughput, restrained both by price rises and conservation efforts and with no expansion, was down 5%. Developments in the construction industries were definitely negative, cement sales declining 14%.

On the basis of sales, available data on production of mineral commodities are given in table 1.

## TRADE [18]

Denmark's 1974 trade in mineral commodities resulted in another deficit, amounting to about $2.5 billion (DKr 15 billion),[19] an 80% increase compared with 1973 figures.[20] By value, Denmark was a net importer for all mineral commodity groups but metal scrap. The 1974 trade surplus in scrap was due mainly to exports of copper and iron, about equal in value. Value of net scrap exports increased 71%. Value of net imports of mineral commodities increased for all groups except for nonmetallic mineral manufactures, which declined 68%. Largest per year increases in value of net imports were for coal and coke (185%), petroleum and petroleum products (127%), and crude fertilizers and minerals (127%).

Petroleum and petroleum products constituted an increasing portion of net import value, rising to 59% of the total for 1974 from 47% of the total for 1973. Price increases were responsible, as volume of petroleum imports declined while unit value of net imports increased by about 180% for crude oil and 110% for petroleum products. Iron and steel was the only other commodity group which accounted for over 10% of net import value and amounted to 20% of the 1974 total, down from 28% in 1973. In terms of value, distribution of principal imports between commodity groups was about the same both for imports and exports. Petroleum and petroleum products amounted to approximately half or more of each total, while iron and steel comprised about one-fifth and nonferrous metals about one-tenth.

A great majority of Denmark's trade in mineral commodities was with Western Europe, except for petroleum and petroleum products. Even in petroleum, Western European sources accounted for the largest share (47%) of import value; Middle Eastern countries accounted for 36%. Denmark's largest payments for petroleum imports went to Iran (19%), the United Kingdom (17%), the Netherlands (14%), and Saudi Arabia (5%). Sweden was the main buyer of petroleum exports, taking 73% by value; almost all the rest went to other countries in Western Europe. For other minerals and metals, the chief Western European trading partners, roughly in order of importance on a value basis, were West Germany, Sweden, Norway, and the United Kingdom. West Germany dominated as a source of iron and steel and as a buyer of scrap metals. Norwegian products accounted for two-thirds of the cost of imported manufactured fertilizers. The largest share of trade in nonferrous metals was with Sweden.

Details of Danish trade statistics for 1972 and 1973 are given in tables 5 and 6.

[18] Sources of trade data for 1973, Danmarks Statistik (Copenhagen). Statistisk Tabelvaerk 1975—VI (External Trade of Denmark) 1973, v. 2; for 1974, Handels-statistiske Meddelelser (Monthly Bull. of Foreign Trade), v. 65, No. 12, December 1974.

[19] Conversions from Danish kroner (DKr) to U.S. dollars were made at the following rates for 1973, DKr 6.0495=US$1.00; for 1974, DKr 6.0949=US $1.00, a change of only 1%. Source: International Monetary Fund. International Financial Statistics. V. 28, No. 9, September 1975, p. 118.

[20] Based on the following numerical divisions of the Standard International Trade Classification (S.I.T.C.): 27, 28, 32, 33, 34, 51.3, 52, 56, 66.1, 66.2, 66.31–66.34, 66.7, 67, and 68.

## Table 5.—Denmark: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 17,350 | 6,369 | Mainly to France. |
| Oxide and hydroxide [1] | 61 | 68 | West Germany 41; United States 9. |
| Metal including alloys: | | | |
| Unwrought including scrap | 6,993 | 6,563 | West Germany 2,774; Sweden 1,768; Belgium-Luxembourg 988. |
| Semimanufactures | r 7,620 | 9,151 | Sweden 4,556; West Germany 913. |
| Antimony metal including alloys, all forms | 29 | 59 | Mainly to United States. |
| Chromium, chromite | -- | 2 | NA. |
| Cobalt metal including alloys, all forms | (2) | 7 | Mainly to West Germany. |
| Copper metal including alloys: | | | |
| Scrap | 2,133 | 9,249 | West Germany 7,921. |
| Unwrought | 3,329 | 1,637 | West Germany 663; Portugal 643. |
| Semimanufactures | r 3,305 | 3,793 | United Kingdom 2,207; Sweden 1,043. |
| Iron and steel: | | | |
| Ore and concentrate | r 8,403 | 6,154 | West Germany 4,954. |
| Roasted pyrite | 95,527 | 70,729 | West Germany 36,556; Netherlands 34,173. |
| Metal: | | | |
| Scrap | 88,853 | 112,388 | Sweden 34,011; West Germany 32,811; Spain 22,672. |
| Pig iron including cast iron | 22 | 226 | Mainly to Sweden. |
| Sponge iron, powder, shot | 295 | 249 | Mainly to West Germany. |
| Ferroalloys | 2 | 4 | Do. |
| Steel, primary forms | 1,671 | 18,573 | Turkey 6,422; Belgium-Luxembourg 4,191; West Germany 3,284. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 91,195 | 65,950 | West Germany 25,605; Sweden 19,991; United Kingdom 9,035. |
| Universals, plates, sheets | 126,934 | 143,774 | Sweden 78,416; Norway 27,191; West Germany 26,842. |
| Hoop and strip | 4,977 | 5,219 | Sweden 4,908. |
| Rails and accessories | 12,294 | 9,318 | Italy 4,067; West Germany 2,293. |
| Wire | 4,178 | 4,325 | Sweden 3,058; Finland 558. |
| Tubes, pipes, fittings | 19,707 | 25,162 | Sweden 15,618. |
| Castings and forgings, rough | 7,655 | 7,585 | Sweden 4,789; West Germany 868; Norway 704. |
| Total semimanufactures | 266,940 | 261,323 | |
| Lead: | | | |
| Ore and concentrate | 900 | 593 | All to West Germany. |
| Oxides | r 12 | 16 | Sweden 6; Malta 5; Iceland 2. |
| Metal including alloys: | | | |
| Scrap | 650 | 2,169 | West Germany 1,402; Sweden 535; United Kingdom 233. |
| Unwrought | 3,790 | 5,223 | Norway 1,302; Netherlands 585; Sweden 573. |
| Semimanufactures | 204 | 140 | Finland 77; France 19; Sweden 17. |
| Magnesium metal, including alloys, all forms | 128 | 60 | United States 43; United Kingdom 12. |
| Manganese oxides | r 3 | 3 | NA. |
| Mercury 76-pound flasks | r 15 | 35 | All to Finland. |
| Molybdenum metal including alloys, all forms | 2 | 1 | All to West Germany. |
| Nickel metal including alloys, all forms | 228 | 199 | West Germany 77; Sweden 52; United Kingdom 37. |
| Platinum-group metals and silver: | | | |
| Waste and sweepings thousand troy ounces | 1,125 | 1,498 | United Kingdom 575; Sweden 418; West Germany 228. |
| Metals including alloys: | | | |
| Platinum group do | (2) | (2) | Mainly to East Germany. |
| Silver do | 145 | 158 | Finland 113; Norway 29. |
| Tin metal including alloys: | | | |
| Unwrought long tons | 1,019 | 988 | Hungary 327; Norway 104. |
| Semimanufactures do | 73 | 79 | Sweden 34; Norway 13; Yugoslavia 10. |
| Titanium dioxide | 50 | 535 | West Germany 160; Indonesia 112; Iran 88. |

See footnotes at end of table.

## Table 5.—Denmark: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Zinc: | | | |
| Oxide | 51 | 88 | West Germany 55; Kuwait 15; Norway 10. |
| Metal including alloys: | | | |
| Scrap including blue powder (dust) | 2,371 | 2,645 | West Germany 1,504; Italy 304. |
| Unwrought and semi-manufactures | 309 | 168 | Greenland 36; Norway 27; United States 21. |
| Other: | | | |
| Ash and residue containing nonferrous metals | 6,222 | 3,731 | West Germany 1,371; Netherlands 1,244; United Kingdom 605. |
| Oxides, hydroxides, and peroxides of metals, n.e.s. | 11 | 9 | Finland 4; Sweden 2; Kenya 2. |
| Base metals including alloys, all forms, n.e.s | 5 | 3 | Austria 2; Sweden 1. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 10 | 8 | West Germany 4; Norway 3. |
| Grinding and polishing wheels and stones | 1,049 | 1,191 | Ethiopia 315; Iran 251; Bangladesh 200. |
| Asbestos | 109 | 111 | Yugoslavia 39; Sweden 20; Norway 20. |
| Barite and witherite | r 11 | 37 | Iceland 27. |
| Boron materials: | | | |
| Crude natural borates | -- | 3 | Iraq 2. |
| Oxides and acid | 2 | 8 | NA. |
| Cement | 256,417 | 141,463 | Iceland 30,349; West Germany 24,332; Israel 21,018. |
| Chalk | 16,510 | 16,933 | Sweden 10,315; Norway 3,673; Finland 2,284. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s | 3,753 | 4,825 | Sweden 1,298; Finland 1,084; West Germany 528. |
| Products: | | | |
| Refractory [3] | 46,064 | 42,615 | United Kingdom 11,750; West Germany 6,214. |
| Nonrefractory | 93,869 | 72,442 | West Germany 51,756; Norway 9,541. |
| Cryolite and chiolite | 17,870 | 31,070 | NA. |
| Diamond: | | | |
| Gem, not set or strung value, thousands | $26 | $23 | Belgium-Luxembourg $11. |
| Industrial do | r $1 | -- | |
| Diatomite and other infusorial earth | 56,420 | 62,916 | West Germany 42,760; United Kingdom 8,315. |
| Feldspar and fluorspar | 520 | 20 | Mainly to Australia. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Phosphatic | -- | 1 | All to Iceland. |
| Other | r 251 | 281 | Sweden 254; United States 26. |
| Manufactured: | | | |
| Nitrogenous | 49 | 88 | Iceland 39; West Germany 27; Japan 14. |
| Phosphatic | 49,570 | 3,742 | Mainly to East Germany. |
| Potassic | 22 | 14 | All to Sweden. |
| Other including mixed | 449 | 257 | Netherlands 122; Sweden 74; Japan 27. |
| Ammonia | r 15,959 | 5,133 | West Germany 3,084; Sweden 2,037. |
| Graphite, natural | 4 | (2) | NA. |
| Gypsum and plasters | 38 | 1,232 | Mainly to Sweden. |
| Lime | 15,591 | 27,666 | Norway 15,267; Sweden 9,124. |
| Magnesite | 2 | 32 | Mainly to Brazil. |
| Mica, all forms | 46 | 41 | Brazil 15; Switzerland 10; Portugal 5. |
| Pigments, mineral including processed iron oxide | r 287 | 399 | Finland 186; West Germany 108. |
| Precious and semiprecious stones, except diamond kilograms | 211 | 169 | Sweden 97; Norway 42. |
| Salt | 123,742 | 167,035 | Sweden 116,531; Norway 39,962. |
| Sodium and potassium compounds, n.e.s | 959 | 50 | Iceland 35; Sweden 11. |

See footnotes at end of table.

## Table 5.—Denmark: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 72,147 | 40,825 | Mainly to West Germany. |
| Worked | 1,470 | 1,424 | West Germany 1,083; Netherlands 151. |
| Dolomite, chiefly refractory grade | 46 | 205 | Finland 151; Sweden 53. |
| Gravel and crushed rock thousand tons | 3,524 | 2,625 | Mainly to West Germany. |
| Limestone (except dimension) | 103,547 | 84,567 | Sweden 48,995; West Germany 24,321; Norway 11,160. |
| Quartz and quartzite | 35 | 148 | Sweden 84. |
| Sand excluding metal bearing | 140,570 | 175,055 | Sweden 114,699; West Germany 29,869; Norway 18,137. |
| Sulfuric acid | 45 | 22 | Iceland 13. |
| Talc, steatite, soapstone, pyrophyllite | 66 | 74 | Yugoslavia 24; Nigeria 16; Iceland 16. |
| Other nonmetals, n.e.s | | | |
| Crude | 1,218 | 1,856 | West Germany 720. |
| Slag, dross, and similar waste not metal bearing | 30,556 | 49,584 | West Germany 39,542; Norway 9,910. |
| Oxides and hydroxides of magnesium, strontium, barium | 1 | 11 | Mainly from Sweden. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 48 | 181 | Norway 86; Sweden 61; United Kingdom 20. |
| Carbon black and gas carbon | 253 | 158 | Sweden 102; Norway 25. |
| Coal and coke including briquets | 62,009 | 62,914 | Sweden 34,448; Norway 19,236; West Germany 5,208. |
| Gas hydrocarbon, liquefied | 4,527 | 10,178 | United Kingdom 4,417; Sweden 2,450; Norway 1,595. |
| Peat including peat briquets and litter | 1,912 | 1,878 | West Germany 1,166; Japan 423. |
| Petroleum refinery products: | | | |
| Gasoline thousand 42-gallon barrels | 5,096 | 6,107 | Sweden 4,902. |
| Kerosine and jet fuel do | 378 | 359 | Sweden 277; Norway 82. |
| Distillate fuel oil do | 4,896 | 6,357 | Sweden 5,401; Norway 663. |
| Residual fuel oil do | 6,284 | 7,245 | Sweden 4,649; United Kingdom 390; Norway 839. |
| Lubricants do | r 146 | 137 | Norway 97; Sweden 14. |
| Mineral jelly and wax do | 5 | 5 | Sweden 1; Norway 1; Finland 1. |
| Other do | 637 | 891 | Norway 337; Sweden 265; Finland 121. |
| Total do | r 17,442 | 21,101 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 7,827 | 10,646 | Sweden 7,765; Norway 1,505. |

r Revised. NA Not available.
[1] Not including synthetic corundum.
[2] Less than ½ unit.
[3] Including those of magnesite, diatomite, and other refractory materials.

## Table 6.—Denmark: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 35,708 | 1,777 | Mainly from Guyana. |
| Oxide and hydroxide [1] | 456 | 769 | West Germany 370; United States 18; United Kingdom 114. |
| Metal including alloys: | | | |
| Scrap | 904 | 1,014 | East Germany 505; Norway 244; Sweden 184. |
| Unwrought | 3,594 | 6,038 | Norway 3,210; United Kingdom 1,547; Sweden 698. |
| Semimanufactures | 42,728 | 51,896 | Sweden 10,091; Norway 8,565; West Germany 6,952. |

See footnotes at end of table.

## Table 6.—Denmark: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Antimony metal including alloys, all forms | 83 | 23 | United Kingdom 18; People's Republic of China 5. |
| Cadmium metal including alloys, all forms | 8 | 6 | Norway 4; Belgium-Luxembourg 1; United States 1. |
| Chromium: | | | |
| Chromite | 1,203 | 1,279 | Republic of South Africa 1,089; Finland 190. |
| Oxide and hydroxide | 210 | 358 | West Germany 280. |
| Cobalt: | | | |
| Oxide and hydroxide | 4 | 4 | Belgium-Luxembourg 2; Canada 1. |
| Metal including alloys, all forms | 12 | 23 | Belgium-Luxembourg 17; United Kingdom 4. |
| Copper metal including alloys: | | | |
| Scrap | 237 | 220 | Iceland 138. |
| Unwrought | 6,066 | 6,073 | Belgium-Luxembourg 5,019; Sweden 523. |
| Semimanufactures | 30,006 | 34,398 | Sweden 13,043; United Kingdom 5,890; West Germany 5,388. |
| Iron and steel: | | | |
| Ore and concentrate | 84 | 1,602 | Mainly from Sweden. |
| Roasted pyrite | 15,505 | 35,692 | West Germany 23,082; Norway 12,605. |
| Metal: | | | |
| Scrap | 3,382 | 4,228 | Sweden 1,826; West Germany 1,024; United Kingdom 977. |
| Pig iron, including cast iron [2] | 50,002 | 78,822 | U.S.S.R. 29,823; East Germany 26,231; West Germany 13,851. |
| Ferroalloys | 16,438 | 16,917 | Norway 14,355; U.S.S.R. 1,125. |
| Steel, primary forms | 128,938 | 82,689 | Norway 49,457; Sweden 20,574; West Germany 9,997. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections [3] | 447,229 | 485,489 | West Germany 140,538; Belgium-Luxembourg 93,906; France 71,415. |
| Universals, plates, sheets | 723,472 | 772,102 | West Germany 201,960; Sweden 131,290; Belgium-Luxembourg 95,072. |
| Hoop and strip | 75,513 | 83,047 | West Germany 35,655; Belgium-Luxembourg 15,043; Sweden 11,244. |
| Rails and accessories | 16,018 | 15,514 | France 9,802; West Germany 4,119. |
| Wire | 21,585 | 24,370 | West Germany 11,974; Belgium-Luxembourg 5,523; Sweden 3,832. |
| Tubes, pipes, fittings | 162,814 | 212,879 | West Germany 65,084; United Kingdom 40,701. |
| Castings and forgings, rough | 510 | 1,139 | Sweden 267; United Kingdom 202; West Germany 152. |
| Total semimanufactures | 1,447,141 | 1,594,540 | |
| Lead: | | | |
| Oxides | r 926 | 947 | Sweden 310; East Germany 260; United Kingdom 148. |
| Metal, including alloys: | | | |
| Scrap | 6,401 | 6,840 | Norway 3,508; United Kingdom 877; Canada 804. |
| Unwrought | 10,327 | 9,507 | Sweden 3,675; United Kingdom 2,541. |
| Semimanufactures | 1,220 | 1,313 | West Germany 1,145; United Kingdom 132. |
| Magnesium metal including alloys, all forms | r 262 | 154 | Norway 117; West Germany 18. |
| Manganese: | | | |
| Ore and concentrate | 4,810 | 3,385 | People's Republic of China 1,600; Netherlands 1,133. |
| Oxides | r 2,408 | 2,790 | Belgium-Luxembourg 1,022; Japan 1,000; Netherlands 607. |
| Mercury ---- 76-pound flasks | r 360 | 424 | Yugoslavia 90; United Kingdom 67; Netherlands 64. |

See footnotes at end of table.

## Table 6.—Denmark: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Molybdenum metal including alloys, all forms | 3 | 3 | Austria 1; West Germany 1. |
| Nickel: | | | |
| Matte | 64 | 56 | United Kingdom 29; Australia 27. |
| Metal including alloys: | | | |
| Unwrought including scrap | 38 | 60 | Mainly from United Kingdom. |
| Semimanufactures | 607 | 656 | West Germany 318; United Kingdom 120; Canada 75. |
| Platinum-group metals and silver including alloys, all forms: | | | |
| Platinum group thousand troy ounces | 17 | 15 | West Germany 5; Switzerland 4; Sweden 3. |
| Silver do | 3,646 | 3,434 | West Germany 1,193; United Kingdom 1,122; Switzerland 453. |
| Tin: | | | |
| Oxide long tons | 9 | 5 | West Germany 3; United Kingdom 1. |
| Metal including alloys: | | | |
| Scrap do | 236 | 286 | Switzerland 71; Austria 35; Singapore 34. |
| Unwrought do | 826 | 561 | United Kingdom 206; People's Republic of China 172; Netherlands 61. |
| Semimanufactures do | 98 | 123 | United Kingdom 64; West Germany 53. |
| Titanium oxides | 7,251 | 7,946 | Norway 2,814; West Germany 1,151; United Kingdom 1,089. |
| Tungsten metal including alloys, all forms | 15 | 15 | Sweden 9; West Germany 5. |
| Zinc: | | | |
| Oxide | 1,964 | 2,654 | West Germany 1,087; Netherlands 414; U.S.S.R. 300. |
| Metal including alloys: | | | |
| Blue powder including scrap | 1,095 | 866 | Belgium-Luxembourg 295; Norway 271; United Kingdom 233. |
| Unwrought | 14,914 | 14,857 | Norway 4,631; United Kingdom 2,640; Netherlands 2,574. |
| Semimanufactures | 6,962 | 6,000 | Poland 1,974; Yugoslavia 1,407; France 1,282. |
| Other: | | | |
| Ore and concentrate of base metals, n.e.s | 173 | 538 | Republic of South Africa 212; United Kingdom 180; Sweden 69. |
| Ash and residue containing nonferrous metals | 1,366 | 6,629 | West Germany 1,956; Hungary 1,755; Netherlands 1,742. |
| Metals including alloys, all forms: | | | |
| Metalloids | 2,877 | 3,020 | West Germany 1,607; United States 471. |
| Alkali, alkaline earth and rare-earth metals | 180 | 161 | West Germany 116; France 41. |
| Pyrophoric alloys | 6 | 5 | United Kingdom 3; West Germany 1; Austria 1. |
| Base metals including alloys, all forms, n.e.s | 11 | 770 | Mainly from Norway. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 9,627 | 7,865 | Iceland 4,288; West Germany 3,037. |
| Dust and powder of precious and semiprecious stones kilograms | 7 | 8 | Switzerland 4; United States 3; West Germany 1. |
| Grinding and polishing wheels and stones | 1,085 | 1,258 | West Germany 354; Sweden 312; Austria 312. |
| Asbestos | 26,213 | 33,505 | Canada 13,812; Cyprus 8,964. |
| Barite and witherite | r 755 | 3,129 | Ireland 2,165; West Germany 560; Norway 350. |
| Boron materials: | | | |
| Crude natural borates | 2,088 | 3,174 | United States 2,196; Turkey 945. |
| Oxide and acid | 178 | 216 | Turkey 95; France 87. |
| Cement | r 24,249 | 241,669 | Mainly from Sweden. |
| Chalk | 2,209 | 3,406 | Sweden 2,656; France 576. |

See footnotes at end of table.

## Table 6.—Denmark: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, kaolin and other clays | 62,268 | 63,132 | United Kingdom 42,267; Czechoslovakia 8,023. |
| Products: | | | |
| Refractory (including nonclay brick) | 33,570 | 168,645 | West Germany 98,699; Sweden 6,967; Austria 6,176. |
| Nonrefractory | 80,573 | 168,645 | West Germany 98,699; Sweden 22,566; Japan 15,591. |
| Diamond: | | | |
| Gem, not set or strung thousand carats | 4 | 8 | Belgium-Luxembourg 5; Israel 1. |
| Industrial do | r 69 | 70 | Japan 30; West Germany 18; Canada 10. |
| Diatomite, and other infusorial earth | 2,950 | 4,116 | United States 2,075. |
| Feldspar, leucite and nepheline syenite | 9,527 | 8,229 | Norway 7,214. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 9,100 | 5,319 | Mainly from Chile. |
| Phosphatic | 324,355 | 344,959 | Morocco 228,096; U.S.S.R. 98,177; Tunisia 18,615. |
| Potassic | 1,545 | 1,325 | All from West Germany. |
| Manufactured: | | | |
| Nitrogenous | 118,670 | 240,107 | Norway 124,437; West Germany 67,728. |
| Phosphatic: | | | |
| Thomas (basic) slag | 460 | 320 | All from West Germany. |
| Other | 15,138 | 8,344 | Netherlands 3,233; Belgium-Luxembourg 2,701; West Germany 1,025. |
| Potassic | 225,929 | 247,703 | West Germany 155,034; East Germany 55,340; U.S.S.R. 25,097. |
| Other including mixed | 406,486 | 608,226 | Norway 504,826; West Germany 97,182. |
| Ammonia | r 225,004 | 249,227 | United States 92,204; Trinidad-Tobago 58,110; Norway 48,166. |
| Fluorspar | 2,792 | 2,070 | France 1,010; United Kingdom 791; West Germany 259. |
| Graphite, natural | 174 | 221 | Norway 91; West Germany 82; United Kingdom 42. |
| Gypsum and plaster | r 227,153 | 304,000 | France 149,500; Poland 1,085. |
| Lime | 2,724 | 3,444 | West Germany 2,121; Poland 1,085. |
| Magnesite | 6,388 | 6,110 | Austria 2,916; Czechoslovakia 1,801. |
| Mica: | | | |
| Crude including splittings and waste | r 283 | 375 | Norway 163; Republic of South Africa 121; United Kingdom 74. |
| Worked including agglomerated splittings | 72 | 117 | Belgium-Luxembourg 48; West Germany 34; Spain 14. |
| Pigments, mineral: | | | |
| Natural, crude | 442 | 442 | Cyprus 259; West Germany 129. |
| Iron oxides, processed | 4,998 | 5,517 | West Germany 4,483; Spain 571. |
| Precious and semiprecious stones, except diamond kilograms | 4,343 | 6,506 | Brazil 3,739; West Germany 2,527. |
| Pyrite | 153,538 | 109,056 | Mainly from Spain. |
| Salt | 231,257 | 175,249 | West Germany 71,614; Italy 30,795; U.S.S.R. 26,957. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude, and partly worked: | | | |
| Calcareous (including marble) | 11,076 | 9,000 | Sweden 3,756; Norway 2,674; Italy 2,347. |
| Slate | 13,725 | 15,625 | Norway 8,796; Switzerland 2,203; West Germany 1,808. |
| Other (granite, gneiss, etc.) | 79,284 | 65,958 | Mainly from Sweden. |
| Worked, all types | 45,302 | 53,088 | Portugal 20,574; West Germany 14,164. |
| Dolomite chiefly refractory grade | 34,832 | 31,347 | Norway 27,831. |
| Gravel and crushed rock | 594,022 | 521,808 | Sweden 474,980. |
| Limestone (except dimension) | r 104,202 | 135,008 | Sweden 112,723. |
| Quartz and quartzite | 4,634 | 5,810 | Norway 2,144; Sweden 1,857; West Germany 1,425. |
| Sand excluding metal bearing | r 118,726 | 122,889 | Mainly from Belgium-Luxembourg. |

See footnotes at end of table.

Table 6.—Denmark: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Sulfur: | | | |
| Elemental, all forms | 12,702 | 15,995 | West Germany 12,507; Finland 2,541. |
| Sulfur dioxide and sulfuric acid | 15,462 | 38,760 | Norway 19,484; Sweden 15,108; West Germany 3,872. |
| Talc, steatite, soapstone and pyrophyllite | 11,550 | 11,249 | Norway 6,471; West Germany 2,352. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 36,903 | 55,087 | West Germany 43,553; Sweden 5,522. |
| Slag dross and similar waste, not metal bearing | 3,734 | 2,232 | United Kingdom 1,155; West Germany 637; Norway 436. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 439 | 924 | United States 612; West Germany 293. |
| Carbon black | 3,575 | 3,873 | United Kingdom 1,294; West Germany 838; Sweden 769. |
| Coal and coke including briquets thousand tons | 2,343 | 3,183 | Poland 2,626; U.S.S.R. 411. |
| Gas, hydrocarbon, liquefied do | r 116 | 116 | Netherlands 34; West Germany 29; United Kingdom 24. |
| Peat, including peat briquets and litter | 14,492 | 17,229 | Sweden 12,084; Finland 2,550; West Germany 1,856. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 72,638 | 71,846 | Saudi Arabia 26,477; Iran 20,712; Kuwait 8,278. |
| Refinery products: | | | |
| Gasoline do | 9,285 | 9,960 | United Kingdom 3,104; Netherlands 2,662; Belgium-Luxembourg 2,059. |
| Kerosine and jet fuel do | 5,456 | 5,456 | Netherlands 2,844; United Kingdom 1,635. |
| Distillate fuel oil do | 30,380 | 32,354 | United Kingdom 11,732; U.S.S.R. 5,570; Belgium-Luxembourg 4,754. |
| Residual fuel oil do | 38,124 | 33,078 | United Kingdom 12,465; Netherlands 7,860. |
| Lubricants do | r 714 | 715 | United Kingdom 368; Netherlands 110; Sweden 103. |
| Mineral jelly and wax do | 141 | 149 | West Germany 92; People's Republic of China 12. |
| Other do | 1,558 | 1,416 | West Germany 482; Netherlands Antilles 482; Netherlands 216. |
| | r 85,658 | 83,128 | |
| Mineral tar and other coal-, petroleum- or gas-derived crude chemicals | 23,833 | 25,772 | Sweden 8,697; West Germany 6,554; Netherlands 6,213. |

r Revised. NA Not available.
[1] Not including synthetic corundum.
[2] Including spiegeleisen, grit, sponge, powder and shot of iron and steel.
[3] Including wire rod.

## COMMODITY REVIEW

**Metals.**—*Iron and Steel.*—Crude steel production continued to be based on scrap melting, with no smelting of the negligible amount of domestic iron ore mined. Denmark imported much more iron and steel than was produced domestically, thus having a surplus of scrap available for export. Production and presumably also consumption rebounded in 1974 to new record levels. Crude steel production was estimated to increase 19% to 535,000 tons, which would put apparent crude steel consumption in excess of the 2.35 million tons reported for 1973. DDS, the main producer, reported 490,000 tons of raw steel manufactures for 1974,[21] an 18% increase. DDS production of finished steel also increased 18% to 456,000 tons, comprising 217,000 tons of plates and 239,000 tons of sections plus some wire rod.

[21] Arsberetning (Annual Report). 1974.

Scrap consumption in 1974 also appeared to be heading upwards towards 1972 levels. For the first half of 1974, total scrap consumption, of which about 96% was accounted for by melt shops, was 26% ahead of the same period in 1973, when 420,000 tons were used. Open hearths (six furnaces) were used for 96% of steel production with one electric arc furnace accounting for the remainder.[22] Both output and dominant furnace type will change as DDS continues with its expansion into an all-electric steelmaking operation. By 1976, capacity is to be raised to 500,000 tons per year both for raw steel and for plate production.

Exports of iron and steel in 1974 increased 20% to 471,000 tons, including 130,000 tons of scrap (scrap export increase of 16%). Imports, however, declined 1% to 1,760,000 tons, a total which contained only 4,300 tons of scrap. Scrap prices, which had more than doubled in 1973, continued to rise during the first half of the year. Product prices likewise increased, as the year-average wholesale price index for iron and steel articles was 27% higher in 1974 than in 1973. Iron and steel stocks in Denmark at yearend included 36,000 tons of pig iron and ferroalloys, 402,000 tons of scrap, and 520,000 tons of semimanufactures.[23]

*Nonferrous Metals.*—The only production of nonferrous metal ore was from a lead-zinc mine in Greenland which began operating late in 1973. There was no primary, only secondary smelting of principal nonferrous metals carried out in Denmark. The industry was reported as consisting of two plants producing a variety of forms of a number of nonferrous metals, two plants specializing in aluminum products, one plant specializing in lead-tin solder, and one plant specializing in producing scrap iron and tin from tinplate scrap.[24] Nonferrous metals consumed in large quantities were lead and zinc, with the consumption pattern reported as follows[25] in thousand tons:

| | 1973 | 1974 |
|---|---|---|
| Aluminum, primary | 2.2 | 1.9 |
| Copper, refined | 5.5 | 5.3 |
| Lead, refined | 18.9 | 22.9 |
| Zinc metal | 12.8 | 13.0 |
| Tin, refined | .6 | .6 |
| Nickel, primary | .1 | .1 |

The most notable change in 1974 was a 21% increase in lead consumption. Production of refined pig lead was reported to have grown 11% to 14,900 tons. Production of aluminum and aluminum alloy semimanufactures and castings was stated to have shown a slight drop to 3,600 tons.

In 1974 production from the first full year of operations at the Black Angel mine in western Greenland amounted to 634,000 tons of ore having a grade of 23.4%, zinc plus lead.[26] Processing was carried out on 575,000 tons to yield concentrates containing 88,500 tons of zinc and 24,100 tons of lead. Shipments were made from Greenland between July and November, mostly to various European smelters, including plants in Belgium and West Germany.[27] Measured and indicated zinc-lead ore reserves declined 19% to 790,000 tons. Surface exploration in the Cover zone of the mine was completed, which indicated presence of ore between this zone and the Angel zone. Detailing of mineralization was started with digging of a 6,000-foot drift from the Angel zone eastwards towards the Cover ore zone. The Black Angel mine was operated by Greenex A/S, 62% owned by Vestgron Mines Limited, itself 62% owned by Cominco Ltd.

Average yearly wholesale price indices for nonferrous metals and articles all increased from 1973 to 1974 as follows: Aluminum, 26%; copper, 24%; lead, 34%; tin, 66%; and zinc, 51%.[28] Net imports of refined copper, brass, bronze, and copper and copper alloy semimanufactures were reported to have declined 16% in 1974 to 29,000 tons. Stocks of unwrought metal, semimanufactures, and scrap in Denmark at yearend included 11,800 tons of aluminum, 17,600 tons of copper, 5,200 tons of lead, and 3,900 tons of zinc.

[22] Eurostat (Luxembourg). Iron and Steel Statistical Bulletin. No. 1, 1975, 272 pp. Organization for Economic Cooperation and Development (OECD) (Paris). The Iron and Steel Industry in 1973 and Trends in 1974. 1975, 86 pp.

[23] Danmarks Statistik (Copenhagen). Statistiske Efterretninger. V. 67, No. 43, July 4, 1975, pp. 997–1001.

[24] T. Tarring (ed.). Non-Ferrous Metal Works of the World. Metal Bulletin Books Ltd., London, 2d ed., 1974.

[25] World Bureau of Metal Statistics (London). V. 28, No. 6, June 1975. pp. 10, 47, 69, 82, 88, 92.

[26] Cominco Ltd. 1974 Annual Report.

[27] Skillings' Mining Review, v. 64, No. 37, Sept. 14, 1974, p. 24.

[28] Danmarks Statistik (Copenhagen). Statistiske Efterretninger. V. 67, No. 16, Mar. 5, 1975, pp. 356, 357.

**Nonmetals.**[29]—*Cement and Other Construction Materials.*—Near-crisis conditions developed in the building industry, as both residential and public construction declined. This was a reaction to the high levels of activity in 1973, which caused limitations to be imposed, which have now been removed. Measures have been taken to stabilize house construction at about 40,000 units per year, 80% of the 1973 rate. During the decline, the number of dwellings under construction fell 30%, new starts were down 49%, and total building area was 32% less than in 1973.

Cement sales in 1974 were down 14% to 2,492,000 tons.[30] While exports recovered to 179,000 tons, a 27% increase, imports almost ceased, dropping to only 4,000 tons. National production capacity in 1974 was estimated as 3.4 million tons per year, with no change in capacity projected for 1975.[31] As of the beginning of 1975, all of Denmark's production of cement was by a single company, A/S Aalborg Portland-Cement-Fabrik (APCF). Denmark's world-scale role in cement technology was evidenced during 1974 by Iraq's order to F. L. Smidth for a 2-million-ton-per-year turnkey cement plant. Chalk production, mainly for cement manufacture, was estimated to exceed 5 million tons.

Stone, sand, and gravel exports were 13% less than in 1973 at about 2.5 million tons. Production of industrial sand was mainly from Bornholm Island off the southern coast of Sweden, where the Swedish firm Ahlsell & Ågren has a plant with a capacity of 250,000 tons per year. Limestone production was estimated as about 3 million tons. Principal producers were A/S Faxe Kalkbrud for industrial limestone and lime and Dansk Landbrugs Grovvareselskab a.m.b.a. (DLG) for agricultural limestone. DLG's largest plant at Aggersund quarried 600,000 tons in 1974, with 1975 production expected to rise to 1 million tons. Gypsum imports increased by 35% for the second straight year, to 409,000 tons. Denmark, the world's only source of a type of diatomaceous earth known as moler, exported a net of 61,000 tons of crude moler and other diatomaceous materials, a 4% increase. Production of moler from the islands of Fuur and Mors was estimated at about 220,000 tons. Sales of refractory and insulating products made from moler and infusorial earth dropped by more than 50%, although exports appeared to climb by about 17%.

*Cryolite and Salt.*—Exports of cryolite increased 12% to 35,000 tons. This material originated from stockpiles in Greenland, having been shipped to Copenhagen for beneficiation by the partly state-owned company, Kryolitselskabet Øresund A/S, the only company in the world which concentrated natural cryolite. Dansk Salt I/S, with a reported production capacity of 350,000 tons per year, was Denmark's only salt producer and was owned equally by Danish and the Netherlands interests. Net imports of salt grew substantially in 1974 to 141,000 tons as compared with only 8,000 tons in 1973.

*Fertilizer Materials.*—Imports, a strong factor in Denmark's agricultural industry, were overall virtually unchanged from 1973. Crude imports were up 3% to 362,000 tons, but imports of manufactured materials were down 3% to 1.07 million tons. The most significant changes in the import pattern were in manufactured materials, of which nitrogenous fertilizers declined 47% to 128,000 tons while compound nitrogenous fertilizers increased 15% to 698,000 tons.

Denmark's largest fertilizer maker, Superfos A/S, increased output by 5% to 880,000 tons in 1974. Of this total, phosphorus (P) and phosphorus-potassium (PK) fertilizers accounted for 72%, and the balance was compound nitrogenous (NPK) fertilizers. The company was somewhat sheltered from large raw materials price increases during the year because long-term contracts for delivery of liquid ammonia and sulfur had already been made before the oil crisis. Pressure from raw materials prices, however, resulted in significant price increases for finished products. A new plant being built for producing ammonium nitrate solution and doubling of granulation capacity by mid-1976 will more than double Superfos capacity for NPK production to 600,000 tons per year. An additional plant is also to be built to increase nitric acid production. At yearend 1974, operations were consolidated at two plants in Jutland as production at the Kalundborg factory was terminated. Late in the year, Superfos and DLG withdrew from a British-Scandinavian project to produce ammonia from gas from Norway's

[29] Industrial Minerals. The Industrial Minerals of Denmark. No. 89, February 1975, pp. 9–29.
[30] Danmarks Statistik (Copenhagen). Varestatistik (Manufacturers Sales of Commodities). 4th quarter 1974. 136 pp.; 1973, 126 pp.
[31] OECD (Paris). The Cement Industry—Statistics 1973, Trend 1974. November 1974, p. 35.

Frigg Field at a plant at Peterhead, Scotland; the project will continue.

Consumption of plant nutrients in Danish agriculture increased further during the 1973–74 fertilizer year. In terms of nutrients, consumption amounted to 365,000 tons of nitrogen, 70,000 tons of phosphorus, and 180,000 tons of potassium. Total consumption of the main types of fertilizers was about 1.96 million tons, approximately two-thirds of which was supplied by Superfos.[32]

**Mineral Fuels.**—*Energy Balance and Electric Power.*—Denmark was almost completely dependent on foreign sources of primary energy, having no domestic production of either coal or natural gas and only negligible production of oil and hydropower. In 1973, foreign primary energy supplied 99.6% of Denmark's net consumption of 25.4 million tons of coal equivalent, of which 89% came from oil and 11% from coal.[33] Space heating accounted for 60% of final inland energy consumption. Gross inland consumption dropped 9% in 1974 to 25.4 million tons of coal equivalent as compared with 28 million tons in 1973. Total energy imports declined 4%; petroleum and petroleum products accounted for 88% of energy imports, with 11% coming from coal and coke. The national total energy balance is given in thousand tons coal equivalent in the following tabulation:

| Total energy | 1973 | | | 1974 | | |
|---|---|---|---|---|---|---|
| | Distribution | | | Distribution | | |
| | Percent | Quantity | Total | Percent | Quantity | Total |
| Domestic production | -- | -- | 105 | -- | -- | 130 |
| Total imports | -- | -- | 33,956 | -- | -- | 32,546 |
| Petroleum and petroleum products | 89 | 30,315 | -- | 88 | 28,698 | -- |
| Coal and Coke | 9 | 3,144 | -- | 11 | 3,629 | -- |
| Total exports | -- | -- | 4,491 | -- | -- | 4,568 |
| Petroleum products | 89 | 3,987 | -- | 83 | 3,769 | -- |
| Stock changes | -- | -- | +589 | -- | -- | • +1,929 |
| Bunkers | -- | -- | 1,004 | -- | -- | 758 |
| Gross inland consumption | -- | -- | 27,977 | -- | -- | 25,421 |
| Losses and nonenergy uses | -- | -- | 2,557 | -- | -- | NA |
| Final energy consumption | -- | -- | 25,420 | -- | -- | NA |
| Households, etc | 60 | 15,324 | -- | -- | -- | -- |
| Industry | 22 | 5,641 | -- | -- | -- | -- |
| Transportation | 18 | 4,455 | -- | -- | -- | -- |

• Estimated. NA Not available.

Practically all Denmark's generation of electricity was by conventional thermal powerplant; 0.1% was hydroelectric. As shown in the following tabulation, household usage, at 72% of the total, was dominant in the electrical energy consumption pattern, as it was for total energy consumption. Final electrical energy consumption in 1974 was 15.5 billion kilowatt-hours, 1% less than in 1973. Net production of electricity declined 2% in 1974 to 17.6 billion kilowatt-hours.

Denmark joined the International Energy Agency of the Organization for Economic Cooperation and Development (OECD) in November 1974.

Electrical energy data are given in millions of kilowatt hours in the following tabulation:

[32] Superfos A/S (Vedbaek). Annual Report and Accounts, 1974, graph p. 6.

[33] Eurostat (Luxembourg). Energy Statistics. 1975, No. 2, pp. 3, 7, 16, 17, 55, 79, 94–95.

| Electrical energy | 1973 | | 1974 | | |
|---|---|---|---|---|---|
| | Distribution | | Distribution | | |
| | Quantity | Total | Percent | Quantity | Total |
| Generation | -- | 19,120 | -- | -- | 18,756 |
| Conventional thermal | 19,096 | -- | 99.9 | 18,732 | -- |
| Hydroelectric | 24 | -- | -- | 24 | -- |
| Net exports | -- | 224 | -- | -- | 83 |
| Gross inland consumption | -- | 18,896 | -- | -- | 18,673 |
| Losses: | | | | | |
| Power stations, refineries | -- | 1,341 | -- | -- | 1,340 |
| Network | -- | 1,880 | -- | -- | 1,843 |
| Final energy consumption | -- | 15,675 | -- | -- | 15,490 |
| Households, etc | 11,543 | -- | 72 | 11,125 | -- |
| Industry | 4,025 | -- | 28 | 4,270 | -- |
| Transportation | 107 | -- | -- | 95 | -- |

*Coal and Coke.*—Imports of coal and coke both grew by about one-fifth in 1974. Coal imports were up 20% to 3.63 million tons. Coke imports increased 19% to 160,000 tons, corresponding to about 5% of the coal volume. Poland was by far the largest supplier of coal, with 85% of the total, while the Soviet Union (9%) and Canada (4%) furnished most of the balance. The majority of coke imports was about equally distributed between France, West Germany, and the Soviet Union. Primary usage for coal was in thermal powerplants, minor amounts being used industrially and for gas production. Increases in annualized raw material price indices for coal and coke accelerated to 42% and 29%, respectively. Domestic coal stocks at yearend were 2.1 million tons, about 30% greater than in 1973.

*Petroleum.—Consumption and Refining.*—Consumption in 1974, estimated at 325,000 barrels per day (16 million tons per year), was down 10% from 360,000 barrels per day (17.8 million tons per year) in 1973.[34] Production of 86,000 tons from the Danish North Sea territory amounted to only 0.5% of consumption. Therefore, crude oil needs were met almost entirely by imports. Crude imports in 1974 totaled 9.28 million tons, 5% less than in 1973, but at a value of DKr4.5 billion, 167% greater. Principal supplying countries were Iran (47%); Saudi Arabia (12%); Kuwait (8%); Nigeria (7%); Oman (5%); and Qatar (4%). There were no exports of crude oil.

Imports of petroleum products were about four times as great as exports in both quantity and value. Imports were 7% less than in 1973 at 10.7 million tons, but at a value of DKr6.16 billion, 105% greater. Principal import sources, each for about one-fourth of the total, were the United Kingdom and the Netherlands. Heavy fuel oils comprised 43% of imports and heating oil 32%. Petroleum products exported came to 2.63 million tons, an 8% decrease; exports consisted of about 43% middle distillates, 27% gasolines, and 22% residual oils. Value of overall net imports of crude oil and petroleum products increased 125% to $1.48 billion.

Refinery throughput dropped 5% to 9.2 million tons in 1974. Combined capacity of the three refineries, 220,000 barrels per day (10.9 million tons per year), amounted to about 60% of requirements. A 200,000-barrel-per-day refinery proposed at Kalundborg by JOC Oil Co., Ltd. of the Netherlands would almost double Danish refinery capacity.[35]

The yearly average raw material price index for crude oil increased by 177% from 1973 to 1974. The peak price was reached in February 1974, after which the index dropped and held steady at a value about 4% less. Increases in indices for major petroleum products in the corresponding period amounted to 110% for gasoline, 88% for heating oil, and 141% for fuel oil. Domestic stocks at yearend included 4.35 million tons of petroleum products and 623,000 tons of crude oil.

*Exploration and Development.*—Dansk Undergrunds Consortium (DUC) announced plans to expand production from the Dan Field in the North Sea from current levels in the vicinity of 100,000 tons per year towards the original 1976 target of 1.25 million tons per year. Three wellhead platforms, each with six wells, are to

[34] Petroleum Publishing Co. International Petroleum Encyclopedia. Tulsa, Okla., 1975, pp. 18, 311, 315, 330, 336, 337, 397, 398.
[35] World Petroleum Report. V. 21, 1975, p. 68.

be installed. In December, Gulf Oil Corp. withdrew from DUC, leaving a four-party group consisting of Royal Dutch/Shell (40%), A. P. Moeller (30%), Standard Oil Co. of California (Chevron, 15%), and Texaco, Inc. (15%). The Danish firm A. P. Moeller remained as operator. Exploration efforts of DUC met with mixed success. Oil was reported at the discovery well M–8 a mile northwest of Dan at a depth of 11,483 feet, about 4,900 feet deeper than at Dan. A third well on the E structure, however, was found not to have reservoir conditions suitable for production. On land in northern Jutland, DUC gave up on an 8,563-foot wildcat. In the Baltic, A. P. Moeller, acting for DUC, contracted for a Norwegian seismic vessel to follow up promising aeromagnetic surveys near Bornholm Island.[36]

Initial steps were taken towards beginning oil exploration around Greenland. Bids were called for on 25,000 square miles off western Greenland between the 60th and 72d parallels. The Danish Ministry for Greenland received bids from 23 companies from 9 nations. Drilling is not expected to commence before 1976. Leasing terms may result in government revenues amounting to 80% of net profits.[37] Production costs are expected to be about $9,000 per daily barrel of production, higher even than for North Sea oil.[38] Other areas of eastern and northern Greenland have more geological promise, but entail even greater costs. Applications were also reported for concessions to do preliminary work off the Faeroe Islands.

## ICELAND [39]

In common with other nations attempting to diversify and expand their economies, Iceland took a battering from increased petroleum prices and a continued domestic inflation rate of 30%. The resultant political crisis brought about the formation of a new government. The present government is more favorably disposed to foreign investment, as indicated by the establishment of the Icelandic Alloys Ltd., a joint venture between the Government of Iceland and Union Carbide Corp., New York, for the production of ferrosilicon. Lacking an established body of laws or regulations concerning foreign investment, the Government is taking a cautious approach. As a result, foreign investment and proposals are considered on a case-by-case basis. Government participation would most likely be required in a major foreign investment because of the small size of the Icelandic economy. Foreign investment would probably be restricted to energy intensive industries since cheap hydroelectric power is available. Another possibility is the production of chemicals from geothermally heated seawater. The combination of limited manpower, heavy national debt, and high inflation, with little prospect of improvement before 1976, makes any new mineral developments unlikely in the near future.

### PRODUCTION

Decreases in output of aluminum and cement reflected the general decline in mineral production in 1974. Icelandic Aluminum Co.'s (ISAL) smelter production dropped 12% to 69,600 tons from 72,000 tons in 1973. A slackening of the construction boom caused cement production to drop 25% to 101,000 tons from 133,900 tons in 1973. Output of sand and gravel showed a significant decrease with the output of stone, up sharply from 168,000 tons to 270,000 in 1974. Output of fertilizer increased from 30,000 tons to 35,270 tons in 1974. Pumice dropped from 19,000 tons in 1973 to 6,930 tons in 1974.

Mineral production value increased an estimated 19% above the 1973 level, from $58.5 million to $69.6 million in 1974. Both figures exclude production of clay products, for which value data are not available. The increase in value can be credited almost entirely to inflation.

### TRADE

Aluminum exports declined 12.5% in 1974 as a result of the general malaise in world markets. A corresponding reduction occurred in the country's total mineral commodity exports, the greatest part of which consists of aluminum shipments.

[36] World Oil. V. 181, No. 3, Aug. 15, 1975, p. 111.
[37] Page 72 of work cited in footnote 35.
[38] Dullforce, W. The Financial Times, No. 26775, Sept. 22, 1975. p. 16.
[39] Prepared by W. Timothy Adams, physical scientist, Division of Nonmetallic Minerals.

Exports of diatomite were up in value but added only $3.3 million to the country's trade balance. The only other mineral-related products exported were scrap metals.

An attempt to maintain full employment and an expanding economy kept mineral imports in 1974 at a high level. Refined petroleum products constituted the largest category of imported minerals in value followed by alumina, manufactured fertilizers, and crude metal shapes.

Reduced aluminum exports and increased mineral imports resulted in Iceland's balance of trade reaching the critical stage. The country's need to import practically all mineral commodities consumed results in a normally deficit trade balance. Although increased aluminum exports produced a slight mineral trade surplus in 1973, increased petroleum product prices and Iceland's rampant inflation resulted in 1974 in the largest trade deficit recorded. Recovery of world aluminum markets and politically unpopular import controls offer the only hope of restoring the mineral trade deficit to near normal proportions. Balances of total commodity trade and mineral trade in 1972 through 1974 were as follows, in million dollars:

| | 1972 | 1973 | 1974 |
|---|---|---|---|
| Total commodity trade: | | | |
| Exports | 191.4 | 278.1 | 328.0 |
| Imports | 233.4 | 340.4 | 524.4 |
| Balance | −42.0 | −62.3 | −196.4 |
| Mineral commodity trade: | | | |
| Exports | 33.6 | 50.5 | 51.8 |
| Imports | 39.8 | 39.6 | 90.9 |
| Balance | −6.2 | 10.9 | −39.1 |

**Table 7.—Iceland: Mineral commodity trade**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **EXPORTS** | | |
| **METALS** | | |
| Aluminum metal including alloys, unwrought | 59,237 | 79,843 |
| Iron and steel scrap | 1,723 | 3,345 |
| Nonferrous metal scrap and metal bearing residues | 634 | 754 |
| **NONMETALS** | | |
| Diatomite | 19,690 | 22,269 |
| Pumice stone | 17,217 | 17,608 |
| **IMPORTS** | | |
| **METALS** | | |
| Aluminum: | | |
| Alumina | r 63,902 | 138,751 |
| Metal including alloys: | | |
| Scrap | 155 | -- |
| Unwrought | 20 | 32 |
| Semimanufactures | 718 | 962 |
| Chromium: | | |
| Oxide and hydroxide | 3 | 2 |
| Copper: | | |
| Metal including alloys: | | |
| Unwrought and semimanufactures | 153 | 963 |
| Iron and steel: | | |
| Metal: | | |
| Scrap | 5 | 104 |
| Pig iron, ferroalloys, similar materials | 208 | 223 |
| Steel, primary forms | 129 | 1 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections | 14,996 | 19,015 |
| Universals, plates, and sheets | 9,381 | 12,707 |
| Hoop and strip | 693 | 600 |
| Rails and accessories | 44 | 123 |
| Wire | 380 | 258 |
| Tubes, pipes, fittings | 6,272 | 6,576 |
| Total | 31,766 | 39,279 |
| Lead: | | |
| Oxides | 11 | 13 |
| Metal including alloys: | | |
| Unwrought | 66 | 82 |
| Semimanufactures | 107 | 29 |
| Mercury 76-pound flasks | 6 | 6 |
| Nickel metal including alloys, all forms | 10 | 2 |

See footnotes at end of table.

## Table 7.—Iceland: Mineral commodity trade—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| **IMPORTS—Continued** | | | |
| **METALS—Continued** | | | |
| Platinum-group metals and silver: | | | |
| Metals, including alloys: | | | |
| Platinum-group | value, thousands | $13 | $29 |
| Silver | thousand troy ounces | 74 | 74 |
| Thorium and uranium oxides | kilograms | 500 | 700 |
| Tin, unwrought and semimanufactures | long tons | 16 | 12 |
| Titanium oxides | | 720 | 618 |
| Tungsten metal, including alloys, all forms | value | $827 | $1,098 |
| Zinc: | | | |
| Oxide | | 16 | 11 |
| Metal including alloys: | | | |
| Blue powder | | 5 | 2 |
| Unwrought | | 112 | 36 |
| Semimanufactures | | 60 | 66 |
| Other: | | | |
| Oxides, hydroxides, peroxides of metals, n.e.s | | 7 | 4 |
| Metals including alloys, all forms: | | | |
| Metalloids | | 48 | 37 |
| Base metals, including alloys, all forms, n.e.s | | 37 | (1) |
| **NONMETALS** | | | |
| Abrasives, natural, n.e.s | | 25 | 23 |
| Asbestos | | 13 | 7 |
| Barite and witherite | | 31 | 20 |
| Boron materials | | 11 | 11 |
| Cement, hydraulic | | r 12,400 | 25,076 |
| Chalk | | 198 | 187 |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s | | 283 | 242 |
| Products: | | | |
| Refractory (including nonclay brick) | | r 421 | 462 |
| Nonrefractory | | 1,034 | 1,112 |
| Cryolite and chiolite | | 660 | 200 |
| Diamond, all grades | value | $748 | $821 |
| Diatomite and other infusorial earth | | 1,497 | -- |
| Fertilizer materials: | | | |
| Manufactured: | | | |
| Nitrogenous | | 3,321 | 1,973 |
| Phosphatic | | 9,944 | 1,949 |
| Potassic | | 8,678 | 7,603 |
| Other including mixed | | 30,588 | 23,172 |
| Ammonia | | 2,111 | 1,006 |
| Gypsum and plasters | | 5,820 | 7,718 |
| Lime | | 1,288 | 1,192 |
| Mica, all forms | | 6 | 11 |
| Pigments, mineral, including processed iron oxides | | 29 | 34 |
| Precious and semiprecious stones, except diamond | value, thousands | $8 | $14 |
| Salt and brine | | 48,098 | 35,792 |
| Sodium and potassium compounds, n.e.s | | 261 | 431 |
| Stone, sand, and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | | 69 | 93 |
| Worked | | 14 | 7 |
| Dolomite, chiefly refractory grade | | 5 | 728 |
| Gravel and crushed rock | | 211 | 108 |
| Limestone | | 685 | 1,449 |
| Quartz and quartzite | | 37 | 30 |
| Sand excluding metal bearing | | 68 | 99 |
| Sulfur, all forms | | 2935 | 2454 |
| Talc, steatite, soapstone, pyrophyllite | | 84 | 64 |
| Other nonmetals, n.e.s.: | | | |
| Crude | | 3 | 2 |
| Oxides and hydroxides of magnesium, strontium, barium | | 13 | 2 |
| Building materials of asphalt, asbestos, fiber, cement and unfired nonmetals, n.e.s | | r 240 | 476 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Asphalt and bitumen, natural | | 131 | 5,084 |
| Carbon black and gas carbon | | 16 | 6 |
| Coal, coke, peat | | 802 | 833 |
| Hydrogen, helium, and rare gases | value | $385 | $422 |
| Petroleum refinery products: | | | |
| Gasoline, motor | thousand 42-gallon barrels | 539 | 699 |
| Kerosine and white spirit | do | r 591 | 872 |

See footnotes at end of table.

Table 7.—Iceland: Mineral commodity trade—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| IMPORTS—Continued | | | |
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Petroleum refinery products—Continued | | | |
| Distillate fuel oil | thousand 42-gallon barrels | 2,070 | 2,652 |
| Residual fuel oil | do | 657 | 718 |
| Lubricants | do | 45 | 47 |
| Mineral jelly and wax | do | 2 | 3 |
| Other: | | | |
| Liquefied petroleum gas | do | 7 | 8 |
| Nonlubrication oils, n.e.s | do | 16 | 16 |
| Pitch coke | do | 5 | 6 |
| Bitumen and other residues | do | 38 | 61 |
| Other, n.e.s | do | 2 | 2 |
| Total | do | 3,972 | 5,084 |
| Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals | | 233 | 299 |

r Revised.
1 Less than ½ unit.
2 Mainly sulfuric acid.

## COMMODITY REVIEW

**Ferrosilicon.**—Agreement was reached between Union Carbide and Iceland regarding the building of a ferrosilicon plant at Grundartangi on the north shore of Hualfjordur. Iceland is to own 55% and Union Carbide 45% of the enterprise. Two furnaces will have an initial capacity of 47,000 tons per year of 75% ferrosilicon. Electric power for the plant will come from Sigalda, a hydroelectric plant presently under construction. The ferrosilicon plant will consume 60 megawatts of the 150-megawatt generating capacity.[40]

**Other Minerals.**—Discussions were held during the year between the Iceland Government and several companies concerning the establishment of mineral processing industries that would take advantage of the island's inexpensive hydroelectric power. Iceland's greatest natural resource asset is its great and largely unexploited supply of hydroelectric power. This asset offers the opportunity to diversify the economy away from the fishing industry. However, the effort to expand the electrical power supply in the Eastffords area has suffered a blow. Failure by the contractor to deliver technical equipment for the Lagarfoss powerplant high-tension power grid will result in the rationing of electricity and a cutback of 20% in consumption over the winter. Delivery is not now expected until next spring.[41]

# SWITZERLAND [42]

As a result of its land-locked location and its lack of substantial mineral resources, the major mineral industry of Switzerland in 1974 continued to be its mineral processing operations which refined imported raw materials and exported finished products.

The domestic production of nonmetallic mineral commodities from indigenous natural resources continued during the year. Salt production increased 4% while production of cement and lime decreased 9%, and 18% respectively. Estimated gypsum production remained unchanged. Smelter production of preliminary aluminum, all from imported raw materials, increased 2% during 1974. Production of steel ingots and rolled sheet steel each increased by 2% during 1974. Swiss pig iron production and crude steel castings increased 35%, and 82% respectively, during the year. Imports of crude oil used as petroleum refinery feed stock decreased by 2% as the two major products of Swiss petroleum refineries, distillate fuel oil (gas, oil and diesel fuel) and residual fuel oil, increased 3% and declined 19%, respectively. Imported natural gas more than doubled during the year and totaled 33,224 million cubic feet while production of manufactured gas decreased 31% and totaled 10,282 million cubic feet.

Swiss production of gashouse coke decreased 70% during the year and totaled 30,000 tons.

[40] U.S. Embassy, Reykjavik, Iceland. State Department, Airgram A–32, May 5, 1975.
[41] U.S. Embassy, Reykjavik, Iceland. State Department. Airgram A–76, Oct. 9, 1974.
[42] Prepared by Richard F. Stevens, Jr., physical scientist, Division of Ferrous Metals.

The estimated Swiss gross national product (GNP) continued to increase to a new record high of almost 139.5 billion Swiss francs (SwF), about $46.8 billion, representing an apparent increase of 7.8% over that of 1973.[43] The worldwide economic slump did not reach Switzerland until the latter part of 1974. While the Swiss Government's antiinflation program had begun to reduce domestic demand by mid-1973, a large backlog of orders and continued high foreign demand for Swiss exports kept industry operating at peak capacity and full employment throughout most of 1974. By yearend, foreign demand had eased and the Government's restrictive policies began to slow the pace of economic activity. Real GNP expanded by only 0.2% in 1974.

Faced with weakening domestic and foreign demand, a number of Swiss firms found it necessary to lay off some workers for the first time in many years. However, the number of persons looking for work was less than 0.1% of the total labor force. For long-standing political and sociological reasons, which were amplified by growing public concern over unemployment, the Government continued its attempts to reduce the number of foreign workers in Switzerland which now comprise about 30% of the labor force.

Inflation remained Switzerland's primary economic concern. With rising wages and import costs providing the main impetus, most Swiss economists predicted that consumer prices will increase by about 6% to 8% during 1975.

Helped by a decline in the domestic consumption of petroleum products and increased earnings on capital investments abroad, Switzerland was one of the few nonoil producing countries to have a balance of payments surplus on current account in 1974.

Petroleum, the country's main source of energy, provided over 77% of the total energy consumed in Switzerland during 1974.[44] Hydroelectric and nuclear power accounted for over 17% of the total 1974 Swiss energy consumption, coal provided about 2%, and imported natural gas provided most of the remainder.

Consumption of petroleum products decreased 9% and totaled 100 million barrels during the year. Preliminary data indicated that imports of crude oil decreased almost 2% to 45.0 million barrels in 1974.[45] The United Arab Emirates was the major source of imported crude oil and supplied 35% of the total. Other significant sources of crude oil imports during the year were Libya (16%), Nigeria (14%), Kuwait (12%), Saudi Arabia (9%), Algeria (7%), and Tunisia (5%).

Swiss imports of petroleum refinery products declined in 1974 at an average yearly rate of 11.3%. It was the first time since World War II that oil imports into Switzerland did not expand but drastically dropped. The sharpest decline, 14%, was registered for imports of heating oil as a result of the mildest winter on record and of the high cost of heating oil. The reluctance of motorists to pay the heavy supertax imposed by the Swiss Government on gasoline was evidenced by the 3.9% reduction in gasoline consumption.

Preliminary foreign trade data indicated that 52.6 million barrels of refinery products were imported in 1974, most of which were obtained from sources in the European Communities (EC), mainly from France, West Germany, Italy, and the Netherlands. In addition, some gasoline and distillate fuel oil was imported from the U.S.S.R. The major exports of refined petroleum products were reported to be 1.1 million barrels of residual fuel oil which were shipped primarily to Austria (72%) and West Germany (22%).

The relationship between Swiss mineral commodity trade and total commodity trade is indicated in the following tabulation which also shows the disparity in the balance of trade:

[43] U.S. Embassy, Bern, Switzerland. Economic Trends Report—Switzerland. State Department Airgram A-074, Apr. 11, 1975, 9 pp.
[44] Union Pétrolière (UP). Rapport Annuel 1974 (1974 Annual Report). Zürich, Switzerland, 33 pp.
[45] U.S. Embassy, Bern, Switzerland. Petroleum Statistics. State Department of Airgram A-062, Mar. 24. 1975, 9 pp.

| | Value (million dollars) | | Mineral commodities share of total trade (percent) |
|---|---|---|---|
| | Mineral commodity trade | Total commodity trade | |
| Exports: | | | |
| 1971 | 274 | 5,768 | 4.8 |
| 1972 | 391 | 6,877 | 5.7 |
| 1973 | 583 | 9,472 | 6.2 |
| Imports: | | | |
| 1971 | 1,267 | 7,154 | 17.7 |
| 1972 | 1,426 | 8,471 | 16.8 |
| 1973 | 2,149 | 11,615 | 18.5 |
| Trade balance: | | | |
| 1971 | −993 | −1,386 | XX |
| 1972 | −1,035 | −1,594 | XX |
| 1973 | −1,566 | −2,143 | XX |

XX Not applicable.

During 1973, nonferrous metal exports (excluding ores, concentrate, and scrap), primarily wrought aluminum products, represented about 44% of total Swiss mineral exports by value or over $259 million. Precious and semiprecious stones, including industrial diamond, accounted for 24% or $139 million, and iron and steel valued at $67 million accounted for 12% of Swiss mineral exports in 1973. The Western European countries of the EC and of the European Free Trade Association (EFTA) continued to be the major recipients of Swiss mineral exports.

Mineral fuels, the largest major group of mineral commodity imports in 1973, primarily crude petroleum, contributed $836 million or 39% to the total value of Swiss mineral imports. Imports of iron and steel, valued at $623 million contributed 29%, and nonferrous imports valued at $296 million represented 14% of the total. Imports of gems and semiprecious stones were valued at $172 million in 1973, or 8% of the total reported mineral imports. EC countries continued to be the major source of most of the 1973 Swiss mineral imports (excluding mineral fuels).

Data on Swiss petroleum and petroleum products were converted from metric tons to U.S. barrels of 42 gallons by using the conversion factors given in the 1973 International Petroleum Annual.[45] The 1974 apparent consumption of refined petroleum products in Switzerland, approximately 44% of which was domestically refined from imported crude oil and the remainder of which was imported as refined products, is indicated in the following tabulation, in millions of U.S. barrels:

[46] U.S. Bureau of Mines. International Petroleum Annual, 1973. March 1975, 31 pp.

| Products | 1973 | 1974 | Percent change |
|---|---|---|---|
| Distillate fuel oil | 58.2 | 29.1 | −50.0 |
| Motor and aviation gasoline | 23.1 | 21.2 | −8.2 |
| Residual fuel oil | 17.1 | 33.1 | +93.6 |
| Kerosine and jet fuel | 5.4 | 4.9 | −9.3 |
| Lubricants (including greases) | .7 | .7 | -- |
| Other refined products | 4.5 | 9.0 | +100.0 |
| Refinery fuel and loss | 1.6 | 2.4 | +50.0 |
| Total [1] | 110.5 | 100.5 | −9.0 |

[1] Data may not add to totals shown because of independent rounding.

## Table 8.—Switzerland: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 1 | 12 | All to United Kingdom. |
| Oxide and hydroxide | 153 | 147 | West Germany 30; Finland 21. |
| Metal including alloys: | | | |
| Unwrought | 21,242 | 24,073 | West Germany 10,738; Italy 5,875; France 2,581. |
| Semimanufactures | 39,836 | 44,511 | Austria 5,372; United Kingdom 4,684. |
| Antimony metal including alloys: | | | |
| Unwrought ... kilograms | 67 | 92 | NA. |
| Arsenic trioxide, pentoxide, acids ... do | 20 | 7,533 | Mainly to France. |
| Beryllium metal including alloys, all forms ... do | 117 | 254 | United States 181; West Germany 48. |
| Chromium oxide and hydroxide ... do | 1,496 | 14,134 | Mainly to Austria. |
| Copper: | | | |
| Matte | 196 | 1,617 | West Germany 803; Netherlands 475; Italy 305. |
| Copper sulfate | 98 | 167 | West Germany 94; Austria 66. |
| Metal including alloys: | | | |
| Scrap | 10,878 | 19,114 | West Germany 9,662; Austria 3,111; Italy 2,226. |
| Unwrought | 4,195 | 4,537 | West Germany 2,233; Italy 2,100. |
| Semimanufactures | 9,718 | 11,154 | United States 1,963; Italy 1,325; Israel 1,323. |
| Gold metal, unworked or partly worked ... thousand troy ounces | 962 | 595 | West Germany 377; Italy 67. |
| Iron and steel: | | | |
| Ore and concentrate including roasted pyrite | 8,318 | 3,737 | Mainly to West Germany. |
| Metal: | | | |
| Scrap | 92,342 | 109,421 | Mainly to Italy. |
| Pig iron, ferroalloys, similar materials | 9,419 | 3,739 | West Germany 1,120; Austria 842. |
| Ferroalloys | 9,342 | 3,646 | West Germany 1,097; Austria 836; Italy 699. |
| Steel, primary forms | 783 | 1,018 | Mainly to Italy. |
| Semimanufactures | 133,746 | 135,694 | West Germany 30,384; Austria 27,823; Italy 18,604. |
| Lead: | | | |
| Ore and concentrate ... kilograms | 500 | -- | |
| Oxides | 2 | 5 | Mainly to Austria. |
| Metal including alloys: | | | |
| Scrap | 7,169 | 9,606 | Italy 5,857; Austria 1,405; France 1,151. |
| Unwrought | 1,020 | 1,359 | Italy 1,028; Austria 167. |
| Semimanufactures | 105 | 122 | Denmark 59; Belgium-Luxembourg 40. |
| Magnesium metal including alloys, all forms | 213 | 248 | West Germany 129; Sweden 37. |
| Manganese oxides | 38 | 1 | France.[1] |
| Mercury ... 76-pound flasks | 119 | 298 | West Germany 216; France 40. |
| Molybdenum metal including alloys, all forms | 2 | 1 | Mainly to West Germany. |
| Nickel: | | | |
| Matte, speiss, similar materials | 107 | 38 | West Germany 16; United Kingdom 10; Italy 9. |
| Metal including alloys: | | | |
| Scrap | 600 | 751 | West Germany 402; Italy 219. |
| Unwrought and semimanufactures | 845 | 864 | West Germany 148; France 114; Italy 100. |
| Platinum-group metals and silver, including alloys: | | | |
| Platinum group ... thousand troy ounces | 252 | 336 | Japan 77; France 44; Netherlands 44. |
| Silver ... do | 43,106 | 37,531 | Italy 18,494; France 5,504. |
| Tin metal including alloys: | | | |
| Scrap ... long tons | 146 | 139 | France 79; West Germany 58. |
| Unwrought ... do | 53 | 104 | West Germany 35; Netherlands 20; United Kingdom 20. |

See footnotes at end of table.

## Table 8.—Switzerland: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Tin metal including alloys—Continued | | | |
| Semimanufactures ---- long tons -- | 81 | 46 | Austria 17; West Germany 10; Sweden 7. |
| Titanium oxides | 162 | 485 | West Germany 270; Austria 77. |
| Tungsten metal including alloys, all forms | r 36 | 66 | West Germany 45; United Kingdom 10. |
| Uranium and thorium oxides, including rare-earth oxides ------- kilograms -- | 3,087 | 1,650 | United States 280; Netherlands 142. |
| Zinc: | | | |
| Oxide | 1 | 2 | Mainly to West Germany. |
| Metal, including alloys: | | | |
| Scrap | 1,314 | 1,231 | Italy 754; France 283. |
| Unwrought | 63 | 396 | Austria 229; West Germany 76; Netherlands 48. |
| Semimanufactures | 67 | 155 | West Germany 127. |
| Other: | | | |
| Ore and concentrate | 230 | 175 | Yugoslavia 125; France 18. |
| Ash and residue containing nonferrous metals | 20,812 | 21,234 | West Germany 8,604; Italy 7,852. |
| Waste and sweepings of precious metals | 163 | 144 | France 72; West Germany 55; Italy 15. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | 1,943 | 1,847 | Mainly to West Germany. |
| Metals, including alloys, all forms: | | | |
| Metalloids | 4,661 | 8,455 | West Germany 4,415; United States 2,800. |
| Alkali, alkaline earth and rare-earth metals ---------- kilograms -- | 1,002 | 2,699 | India 1,000. |
| Pyrophoric alloys ---------- do ---- | 1,958 | 288 | West Germany 97; France 81. |
| Base metals, including alloys, all forms, n.e.s | 87 | 81 | West Germany 31; United States 12; France 11. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 19 | 17 | West Germany 5; Italy 4. |
| Dust and powder of precious and semiprecious stones kilograms -- | 1,548 | 3,328 | United Kingdom 1,018; West Germany 835; Belgium-Luxembourg 600. |
| Grinding and polishing wheels and stones | 939 | 1,015 | West Germany 211; United Kingdom 209; France 110. |
| Asbestos | 46 | 30 | Austria 10; Belgium-Luxembourg 4. |
| Barite and witherite | 29 | 3 | All to France. |
| Boron materials: | | | |
| Crude natural borates | 1 | (1) | Mainly to Netherlands. |
| Oxide and acid | 4 | 6 | Mainly to West Germany. |
| Cement | 27,785 | 64,567 | France 47,549; West Germany 16,503. |
| Chalk | 40 | 121 | France 78; West Germany 12. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s | 9,488 | 16,272 | West Germany 13,589; Austria 2,565. |
| Products: | | | |
| Refractory (including nonclay brick) | 1,541 | 1,143 | Austria 494; Italy 231; West Germany 147. |
| Nonrefractory | 47,401 | 40,312 | West Germany 16,441; France 10,265; Austria 10,169. |
| Cryolite and chiolite ----- kilograms -- | 10,800 | 12,221 | Italy 10,000. |
| Diamond: | | | |
| Gem not set or strung, value, thousands -- | $35,163 | $51,708 | France $12,003; West Germany $9,717; Netherlands $5,181. |
| Industrial ---------- do ---- | r $1,472 | $2,424 | West Germany $932; United Kingdom $748; France $196. |
| Diatomite and other infusorial earth --- | 92 | 44 | Austria 40; Italy 5. |
| Feldspar and fluorspar | 275 | 227 | West Germany 96; Peru 75; Sweden 35. |
| Fertilizer materials: | | | |
| Manufactured: | | | |
| Nitrogenous | 90 | 486 | NA. |
| Phosphatic | 10 | 17 | All to West Germany. |

See footnotes at end of table.

## Table 8.—Switzerland: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials—Continued | | | |
| Manufactured—Continued | | | |
| Potassic | 1 | (1) | Mainly to West Germany. |
| Other including mixed | r 580 | 1,168 | Italy 744; France 133. |
| Ammonia | 54 | 73 | Austria 63; France 8. |
| Graphite, natural | 37 | 7 | West Germany.[1] |
| Gypsum and plasters | 5,594 | 6,538 | Mainly to Austria. |
| Lime | 4,697 | 5,262 | West Germany 3,552; France 1,693. |
| Magnesite | 32 | 72 | France 40; West Germany 17. |
| Mica: | | | |
| Crude including splittings and waste | 63 | 90 | Ireland 26; Peru 26; Sweden 12. |
| Worked | 327 | 378 | Sweden 63; Austria 40; United Kingdom 40. |
| Pigments, mineral: | | | |
| Natural, crude | 32 | 49 | Mainly to Peru. |
| Iron oxides, processed | 59 | 62 | France 20; Italy 11; Austria 10. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural, crude -- thousand carats | r 22,325 | 37,975 | India 9,410; Italy 3,795. |
| Manufactured ---------- do | 330,070 | 332,210 | West Germany 62,750; Italy 59,825; Austria 53,800. |
| Pyrite (gross weight) ---- kilograms | 490 | 100 | NA. |
| Salt and brine | 55 | 37 | France 3. |
| Sodium and potassium compounds, n.e.s | 20,714 | 35,245 | Austria 13,463; France 10,041; West Germany 6,452. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 43,303 | 36,967 | West Germany 26,561; Italy 5,116. |
| Worked | 11,156 | 12,997 | Mainly to West Germany. |
| Dolomite, chiefly refractory grade | 57 | 46 | West Germany 4. |
| Gravel and crushed rock | 34,973 | 23,464 | West Germany 17,079; France 2,866. |
| Limestone (except dimension) | 10 | 51 | West Germany 16; Italy 5. |
| Quartz and quartzite | 35,458 | 32,422 | Italy 25,741; West Germany 5,265. |
| Sand excluding metal bearing | 10,201 | 12,693 | West Germany 5,632; France 2,755; Austria 2,174. |
| Sulfur: | | | |
| Elemental, all forms | 153 | 158 | West Germany 133. |
| Sulfur dioxide | 73 | 148 | West Germany 92; Austria 56. |
| Sulfuric acid; oleum | 47,621 | 32,162 | France 18,234; West Germany 12,872. |
| Talc, steatite, soapstone, pyrophyllite | 1,266 | 1,256 | Mainly to Italy. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 297 | 541 | Italy 284; France 174; West Germany 54. |
| Slag dross and similar waste, not metal bearing: | | | |
| From iron and steel manufacture | 4,499 | 2,726 | West Germany 2,305; France 370. |
| Slag and ash, n.e.s | 122 | (1) | West Germany.[1] |
| Oxides and hydroxides of magnesium, strontium, barium | 11 | 12 | West Germany 2. |
| Bromine, iodine, fluorine | 4 | 23 | Ireland 13; France 8. |
| Building materials of asphalt, asbestos, fiber cement, unfired nonmetals, n.e.s | 471 | 768 | France 572; West Germany 84. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 1,007 | 7 | France 2; West Germany 2. |
| Carbon black and gas carbon: | | | |
| Carbon black | 79 | 122 | U.S.S.R. 38; France 37; West Germany 17. |
| Gas carbon ---------- kilograms | 9 | 1 | NA. |
| Coal, all grades, including briquets | 1,921 | 2,599 | Mainly to West Germany. |
| Coke and semicoke | 228,057 | 28,718 | Austria 20,725; Italy 7,993. |
| Gas, hydrocarbon, manufactured | 102 | 91 | Mainly to France. |
| Hydrogen, helium, rare gases | 67 | 110 | Austria 86; West Germany 11. |
| Peat including peat briquets and litter | 501 | 1,523 | Austria 840; France 683. |
| Petroleum refinery products: | | | |
| Gasoline thousand 42-gallon barrels | 2 | 18 | Mainly to Austria. |
| Kerosine and white spirit -- do | (1) | (1) | Do. |
| Distillate fuel oil ---------- do | 22 | 59 | Do. |
| Residual fuel oil ---------- do | 751 | 1,463 | Do. |
| Lubricants ---------- do | r 94 | 55 | France 27; Austria 14. |
| Other: | | | |
| Liquefied petroleum gas ---------- do | 58 | 25 | Mainly to Austria. |
| Unspecified ---------- do | r 4 | 6 | West Germany 2; Austria 2. |
| Total ---------- do | 931 | 1,626 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | r 1,162 | 5,659 | Mainly to West Germany. |

r Revised. NA Not available.
[1] Less than ½ unit.

## Table 9.—Switzerland: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 11,046 | 9,924 | France 6,044; Italy 3,632. |
| Oxide and hydroxide | 162,347 | 146,355 | Guinea 36,816; France 7,686; Surinam 4,114. |
| Metal including alloys: | | | |
| Unwrought | 24,891 | 29,371 | Iceland 16,251; Norway 5,882. |
| Semimanufactures | 12,942 | 21,649 | West Germany 5,650; Norway 3,449; United Kingdom 2,959. |
| Antimony metal including alloys, unwrought | 212 | 95 | People's Republic of China 89. |
| Arsenic trioxide, pentoxide, acids | 24 | 48 | Mainly from France. |
| Beryllium metal including alloys, all forms kilograms | | | |
| Chromium: | | | |
| Chromite | 3,867 | 3,437 | Mainly from Republic of South Africa. |
| Oxide and hydroxide | 544 | 522 | West Germany 275; Italy 110; France 95. |
| Cobalt oxide and hydroxide | 5 | 6 | Belgium-Luxembourg 4; Canada 1; West Germany 1. |
| Columbium and tantalum metal including alloys all forms, tantalum | 2 | 3 | Mainly from United States. |
| Copper: | | | |
| Matte | 30,289 | 27,086 | Belgium-Luxembourg 8,797; West Germany 6,607; Zambia 3,901. |
| Copper sulfate | 609 | 1,091 | U.S.S.R. 630; Bulgaria 208; France 159. |
| Metal including alloys: | | | |
| Scrap | 397 | 505 | Israel 355; France 67; United Kingdom 39. |
| Unwrought | 3,366 | 1,233 | Belgium-Luxembourg 467; West Germany 346; United Kingdom 280. |
| Semimanufactures | 40,807 | 42,353 | United Kingdom 18,801; West Germany 9,744. |
| Gold metal, unworked or partly worked thousand troy ounces | 88 | 137 | West Germany 74; France 17. |
| Iron and steel: | | | |
| Ore and concentrate including roasted pyrite | 28,729 | 28,466 | Mauritania 20,961; Italy 6,781. |
| Metal: | | | |
| Scrap | 78,458 | 63,396 | West Germany 52,680; Netherlands 6,381. |
| Pig iron and similar materials | 56,287 | 83,193 | West Germany 51,329; France 12,279. |
| Ferroalloys | 22,793 | 20,499 | France 5,361; West Germany 3,267. |
| Steel, primary forms | 275,109 | 170,070 | France 57,974; Belgium-Luxembourg 42,230; West Germany 30,113. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections: | | | |
| Wire rod thousand tons | 152 | 141 | West Germany 63; France 53. |
| Other bars and rod do | 233 | 220 | West Germany 81; Italy 54; France 38. |
| Angles, shapes, sections do | 287 | 258 | Belgium-Luxembourg 80; France 80; West Germany 79. |
| Universals, plates sheets do | 674 | 679 | West Germany 227; France 180; Belgium-Luxembourg 67. |
| Hoop and strip do | 214 | 223 | Belgium-Luxembourg 65; West Germany 58; France 30. |
| Rails and accessories do | 64 | 49 | Austria 30; West Germany 8; Italy 5. |
| Wire do | 37 | 43 | Austria 20; West Germany 12. |
| Tubes, pipes, fittings do | 176 | 271 | West Germany 100; France 63; Austria 36. |
| Castings and forgings, rough do | 3 | 4 | West Germany 1; Belgium-Luxembourg 1; France 1. |
| Total do | 1,840 | 1,888 | |

See footnotes at end of table.

## Table 9.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Lead: | | | |
| Ore and concentrate | 1 | (1) | NA. |
| Oxides | 218 | 197 | Mexico 90; Austria 40; West Germany 22. |
| Metal including alloys: | | | |
| Scrap | 10 | 8 | West Germany 5; Yugoslavia 1. |
| Unwrought | 21,830 | 17,034 | United Kingdom 5,171; France 3,025; West Germany 2,921. |
| Semimanufactures | 1,285 | 1,295 | Mainly from West Germany. |
| Magnesium metal including alloys, all forms | 1,053 | 2,059 | Norway 1,363; United States 300; Canada 234. |
| Manganese oxides | 886 | 663 | Japan 403; Belgium-Luxembourg 131; West Germany 70. |
| Mercury 76-pound flasks | 1,567 | 324 | West Germany 201; U.S.S.R. 35. |
| Molybdenum metal including alloys, all forms | 11 | 76 | Mainly from Austria. |
| Nickel: | | | |
| Matte, speiss, similar materials | r 1,497 | 1,077 | Canada 337; Norway 291; United Kingdom 146. |
| Metal including alloys: | | | |
| Scrap | 34 | 27 | United Kingdom 19; France 5. |
| Unwrought | 1,474 | 1,059 | Canada 334; Norway 291; United Kingdom 143. |
| Semimanufactures | 1,228 | 1,667 | West Germany 687; United Kingdom 427; France 186. |
| Platinum-group metals and silver including alloys: | | | |
| Platinum group thousand troy ounces | 208 | 354 | U.S.S.R. 115; West Germany 74; United Kingdom 58. |
| Silver do | 38,377 | 8,735 | West Germany 2,605; United Arab Emirates 1,431; United Kingdom 1,154. |
| Tantalum metal including alloys, all forms | 2 | 3 | Mainly from United States. |
| Tin: | | | |
| Oxides long tons | 32 | 28 | United Kingdom 15; Japan 7; West Germany 3. |
| Metal including alloys: | | | |
| Scrap do | 12 | 14 | West Germany 7; Sweden 6. |
| Unwrought do | 880 | 893 | Malaysia 289; United Kingdom 195; Thailand 175. |
| Semimanufactures do | 217 | 283 | West Germany 116; Netherlands 64; France 40. |
| Titanium oxides | 10,991 | 11,892 | West Germany 3,425; France 2,573; United Kingdom 2,414. |
| Tungsten: | | | |
| Ore and concentrate | -- | 40 | NA. |
| Metal including alloys, all forms | 85 | 99 | Mainly from West Germany. |
| Uranium and thorium oxides, including rare-earth oxides | 11 | 11 | France 3; West Germany 3; United States 2. |
| Zinc: | | | |
| Ore and concentrate | -- | 128 | NA. |
| Oxide | 2,331 | 2,461 | West Germany 1,004; France 743. |
| Metal including alloys: | | | |
| Scrap | 188 | 107 | Mainly from France. |
| Blue powder | 2,321 | 3,037 | Belgium-Luxembourg 1,170; West Germany 854; Netherlands 321. |
| Unwrought | 32,788 | 28,436 | West Germany 6,898; Belgium-Luxembourg 6,083; France 4,475. |
| Semimanufactures | r 4,090 | 5,419 | West Germany 2,000; Belgium-Luxembourg 1,846; United Kingdom 589. |
| Other: | | | |
| Ore and concentrate | r 1,845 | 2,440 | NA. |
| Ash and residue containing nonferrous metals | 759 | 466 | West Germany 229; France 149; Austria 54. |
| Waste and sweepings of precious metals | 24 | 9 | Denmark 3; Sweden 2; West Germany 2. |
| Oxides, hydroxides, peroxides of metals, n.e.s | 1,097 | 2,587 | Mainly from West Germany. |

See footnotes at end of table.

## Table 9.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Other—Continued | | | |
| Metals including alloys, all forms: | | | |
| Metalloids | 1,983 | 2,456 | Netherlands 1,052; West Germany 542; France 528. |
| Alkali, alkaline earth and rare earth-metals | 525 | 428 | Mainly from West Germany. |
| Pyrophoric alloys | 17 | 8 | West Germany 5; Austria 2; United Kingdom 1. |
| Base metals including alloys, all forms, n.e.s | 386 | 666 | Japan 150; Republic of South Africa 139; United States 139. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 1,260 | 2,013 | Italy 868; West Germany 714; Turkey 200. |
| Dust and powder of precious and semiprecious stones kilograms | 866 | 1,272 | Ireland 558; United Kingdom 357; United States 204. |
| Grinding and polishing wheels and stones | 1,576 | 1,623 | West Germany 692; Austria 214; Italy 180. |
| Asbestos | 16,764 | 19,730 | Canada 8,254; Republic of South Africa 4,829; U.S.S.R. 3,193. |
| Barite and witherite | 3,119 | 4,405 | France 2,242; West Germany 1,886. |
| Boron materials: | | | |
| Crude natural borates | 1,253 | 2,449 | Mainly from United States. |
| Oxide and acid | 793 | 1,029 | France 458; United States 291; Belgium-Luxembourg 160. |
| Cement | 510,430 | 431,939 | Italy 167,292; West Germany 165,168; France 94,251. |
| Chalk | 17,826 | 21,416 | Mainly from France. |
| Clays and clay products (including refractory brick): | | | |
| Crude clays, n.e.s | 179,954 | 206,296 | West Germany 75,980; United Kingdom 65,078; France 28,962. |
| Products: | | | |
| Refractory (including nonclay brick) | 35,088 | 35,371 | West Germany 20,850; Austria 4,452; France 3,565. |
| Nonrefractory | 439,567 | 329,185 | Italy 256,434. |
| Cryolite and chiolite | 315 | 465 | All from Denmark. |
| Diamond: | | | |
| Gem, not set or strung value, thousands | $52,987 | $88,586 | Belgium-Luxembourg $31,098; United States $14,561; Netherlands $10,489. |
| Industrial do | $2,214 | $3,834 | West Germany $1,315; Belgium-Luxembourg $955; United Kingdom $808. |
| Diatomite and other infusorial earth | 2,432 | 2,853 | Denmark 813; France 674; United States 516. |
| Feldspar and fluorspar | 13,944 | 17,366 | West Germany 5,963; Norway 4,094; Italy 3,774. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 154 | 170 | Mainly from West Germany. |
| Phosphatic | 15,849 | 18,833 | Morocco 14,333; United States 2,504; Belgium-Luxembourg 1,312. |
| Potassic | 78,677 | 79,190 | Mainly from France. |
| Other | 17,168 | 17,093 | Do. |
| Manufactured: | | | |
| Nitrogenous | 56,843 | 49,922 | West Germany 18,677; Austria 12,978; Italy 8,816. |
| Phosphatic: | | | |
| Thomas (basic) slag | 184,863 | 174,531 | France 111,953; Belgium-Luxembourg 61,270. |
| Other | 15,112 | 10,421 | France 4,219; Belgium-Luxembourg 2,375; Netherlands 2,148. |
| Potassic | 19,469 | 15,819 | West Germany 12,427; France 2,796. |
| Other, including mixed | 80,027 | 86,098 | France 33,270; West Germany 19,685; Belgium-Luxembourg 19,295. |
| Ammonia | 9,704 | 11,273 | France 5,466; Austria 5,016. |
| Graphite, natural | 255 | 237 | West Germany 147; Italy 32; Austria 29. |
| Gypsum and plasters | 135,442 | 158,666 | West Germany 88,844; France 32,268; Austria 27,597. |

See footnotes at end of table.

## Table 9.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Lime | 36,335 | 35,959 | Italy 21,315; West Germany 12,931. |
| Magnesite | 5,340 | 4,163 | Mainly from Austria. |
| Mica: | | | |
| Crude including splittings and waste | 747 | 697 | West Germany 322; United Kingdom 187; India 134. |
| Worked including agglomerated splittings | 224 | 268 | France 189; Belgium-Luxembourg 69. |
| Pigments, mineral: | | | |
| Natural, crude | 293 | 327 | West Germany 139; Austria 80; France 70. |
| Iron oxides, processed | 2,514 | 2,882 | Mainly from West Germany. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural, crude -- thousand carats -- | r 296,015 | 462,735 | Brazil 241,150; United States 80,250; West Germany 48,545. |
| Manufactured do | 107,610 | 142,940 | Mainly from France. |
| Pyrite (gross weight) | 10,240 | 5,020 | Mainly from Italy. |
| Salt and brine | 2,282 | 2,052 | Mainly from France. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 10,592 | 8,651 | France 3,236; Italy 2,654; West Germany 1,583. |
| Caustic potash, sodic and potassic peroxides | 4,084 | 4,326 | West Germany 1,367; France 1,363; Italy 1,205. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous | 36,761 | 32,799 | Italy 22,874; France 7,007. |
| Slate | 886 | 1,090 | Italy 561; West Germany 377. |
| Other | 65,655 | 71,218 | West Germany 46,363; Italy 12,786; France 11,131. |
| Worked: | | | |
| Slate | 1,275 | 1,362 | Italy 1,049; West Germany 138. |
| Paving and flagstone | 52,481 | 48,847 | Italy 37,125; Austria 6,297. |
| Other | 14,535 | 16,190 | Mainly from Italy. |
| Dolomite, chiefly refractory grade | 13,069 | 12,987 | Italy 8,253; France 3,888. |
| Gravel and crushed rock thousand tons | 6,164 | 6,678 | France 2,924; West Germany 1,870; Italy 1,024. |
| Limestone (except dimension) | 61,450 | 65,956 | Mainly from France. |
| Quartz and quartzite | 4,354 | 3,332 | West Germany 2,551; Italy 328. |
| Sand excluding metal bearing thousand tons | 1,573 | 1,839 | Italy 1,018; France 437; West Germany 228. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 38,194 | 50,648 | West Germany 35,895; Canada 7,073; France 5,676. |
| Colloidal | 339 | 324 | West Germany 244; France 70. |
| Sulfur dioxide | 28 | 28 | Italy 19; West Germany 5; France 4. |
| Sulfuric acid, oleum | 2,548 | 2,452 | France 1,209; West Germany 915. |
| Talc, steatite, soapstone, pyrophyllite | 13,794 | 14,142 | Austria 8,497; France 3,211. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Pozzolan and santorin earth | 5,111 | 5,824 | West Germany 3,011; France 2,799. |
| Other | 29,860 | 38,416 | West Germany 19,426; France 8,837. |
| Slag, dross, and similar waste, not metal bearing: | | | |
| From iron and steel manufacture | 87,529 | 70,089 | Mainly from France. |
| Slag and ash, n.e.s | 14,587 | 14,882 | Mainly from West Germany. |
| Oxides and hydroxides of magnesium, strontium, and barium | 295 | 429 | West Germany 97; United States 96; United Kingdom 70. |
| Bromine, iodine fluorine | 1,823 | 2,373 | France 1,256; United Kingdom 604; Israel 297. |
| Building materials of asphalt, asbestos, fiber cement, unfired nonmetals, n.e.s | 16,014 | 18,270 | West Germany 8,988; Austria 6,589. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 1,737 | 1,625 | Trinidad 1,120; United States 244. |
| Carbon black and gas carbon: | | | |
| Carbon black | 8,833 | 10,327 | West Germany 3,896; France 2,288; Netherlands 1,630. |
| Gas carbon | 66 | 46 | All from West Germany. |

See footnotes at end of table.

## Table 9.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Coal and briquets: | | | |
| Anthracite and bituminous coal thousand tons | 147 | 133 | West Germany 66; France 26; Czechoslovakia 14. |
| Briquets of anthracite and bituminous coal ---------- do | 19 | 22 | West Germany 16; France 3; Netherlands 2. |
| Lignite and lignite briquets do | 53 | 56 | Mainly from West Germany. |
| Coke and semicoke ---------- do | 170 | 158 | West Germany 102; France 26. |
| Gas, hydrocarbon, manufactured kilograms | 797 | 1,366 | NA. |
| Hydrocarbon, helium, rare gases | 4,358 | 2,454 | West Germany 1,349; France 746; Italy 283. |
| Peat, including peat briquets and litter | 51,191 | 51,210 | Mainly from West Germany. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 36,143 | 45,909 | Libya 16,044; United Arab Emirates 11,840; Algeria 3,758. |
| Refinery products: | | | |
| Gasoline ---------- do | 15,616 | 14,388 | France 5,822; Italy 4,149; West Germany 3,758. |
| Kerosine and white spirit ---------- do | 719 | 885 | Italy 522; France 191; Netherlands 98. |
| Distillate fuel oil ------ do | 37,151 | 40,150 | France 14,241; Italy 8,788; West Germany 7,341. |
| Residual fuel oil ------ do | 5,527 | 4,651 | France 2,326; West Germany 1,365. |
| Lubricants ---------- do | 753 | 787 | Italy 223; West Germany 139; Netherlands 137. |
| Mineral jelly and wax - do | 76 | 101 | West Germany 58; People's Republic of China 11. |
| Other: | | | |
| Liquefied petroleum gas ---------- do | 1,759 | 2,072 | Netherlands 1,405; West Germany 648. |
| Unspecified ------ do | 4,847 | 3,004 | France 1,622; West Germany 742. |
| Total ---------- do | 66,448 | 66,038 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ------ | 39,120 | 73,697 | West Germany 10,333; France 8,835. |

r Revised. NA Not available.
1 Less than ½ unit.

## COMMODITY REVIEW

**Metals.**—*Aluminum.*—Swiss consumption of unwrought aluminum used to manufacture aluminum products decreased approximately 6% in 1974,[47] and was as follows in tons:

| | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|
| Consumption, unwrought aluminum | 99,700 | 85,200 | 99,124 | 111,500 | • 105,000 |
| Production of aluminum manufactures: | | | | | |
| Wire | 1,638 | 1,769 | 2,495 | 1,461 | NA |
| Rods, bars, sections | 28,010 | 27,016 | 30,484 | 35,440 | NA |
| Plate, sheet, strip | 54,720 | 58,100 | 62,541 | 65,421 | NA |
| Tubes | 2,921 | 3,500 | 2,732 | 2,866 | NA |
| Forgings | 1,047 | 984 | 872 | 782 | NA |
| Total | 88,336 | 91,369 | 99,124 | 105,970 | • 112,200 |

• Estimated on basis of 9-month data. NA Not available.

*Copper.*—Swiss consumption of refined copper increased 18% in 1974, Swiss production of copper semimanufactures increased 9%, and production of copper alloy semimanufactures increased 4%,[48] and was as follows in tons:

| | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|
| Consumption, refined copper | 48,100 | 40,500 | 30,100 | 25,500 | 30,200 |
| Production: | | | | | |
| Copper semimanufactures: | | | | | |
| Wire | 40,712 | 39,111 | 39,942 | 37,341 | 41,296 |
| Rods, bars, sections | 2,288 | 2,148 | 1,768 | 1,693 | 1,927 |
| Plates, sheets, strip | 2,035 | 2,060 | 2,421 | 2,169 | 2,564 |
| Tubes | 2,191 | 1,598 | 1,772 | 2,563 | 1,986 |
| Total (copper) | 47,226 | 44,917 | 45,903 | 43,766 | 47,773 |
| Copper alloy semimanufactures: | | | | | |
| Wire | 4,804 | 4,460 | 4,590 | 5,040 | 5,545 |
| Rods, bars, sections | 24,266 | 22,280 | 21,020 | 24,031 | 23,633 |
| Plates, sheets, strips | 15,248 | 13,111 | 12,323 | 14,588 | 16,054 |
| Tubes | 1,971 | 1,711 | 1,578 | 1,606 | 1,807 |
| Total (copper alloy) | 46,289 | 41,562 | 39,511 | 45,265 | 47,039 |

*Silicon.*—During 1974, two Swiss silicon-ferrosilicon producers were located at Bodio in southeastern Switzerland about 55 miles north of the Italian border.[49] Monteforno Acciaierie E. Laminatoi, the major producer had a reported capacity of 8,000 tons per year while Gotthardwerke für Electrochemische Industrie, a subsidiary of Lonza AG, had a rated capacity of 800 tons per year.

*Steel.*—Almost all of the 605,000 tons per year of steel produced by Switzerland's four steel works and about 80% of the 2 million tons per year of imported steel reaches Swiss consumers through metal dealers.[50] Steel trade in Switzerland is conducted through metal traders which act as intermediaries between mill and consumer. The size and scope of Swiss steel traders activities vary considerably. The amount of processing carried out by steel traders is increasing and includes decoiling, slitting, guillotining, flame cutting, and other methods of preparing steel to the customer's desired specifications.

There are currently about 150 steel stockholding firms (dealers) in Switzerland employing about 10,000 people which have a yearly turnover of about $500 million. Nearly all of these firms are members of eight regional trade groups under a central

[47] World Bureau of Metal Statistics (London). World Metal Statistics. V. 28, No. 3, March 1975, 108 pp.
[48] Page 57 of reference cited in footnote 47
[49] Metal Bulletin Monthly (London). Silicon Slow-Down. No. 48, December 1974, pp. 40–42.
[50] Metal Bulletin Monthly (London). Steel Stockists in Norway, Sweden, and Switzerland. No. 41, May 1974, pp. 29, 31, 33.

body, Schqeizerische Stahlandelszentrale (SSZ), based in Basel.

**Nonmetals.**—*Cement and Other Construction Materials.*—During 1974, 15 Swiss cementworks located in 11 Cantons (Aargäu, Bern, Graubünden, Neuchâtel, St. Gallen, Schwyz, Schaffhausen, Solothurn, Tessin, Valais, and Vaud) produced almost 5.3 million tons of cement, a decrease of 9% compared with 1973 production.[51] Less than 1% of this material was exported. In addition, three clinker grinding plants were operated in the Cantons of Basel-Land, Geneva, and Tessin.

Consumption of cement in Switzerland during 1974, including imports of 58,219 tons, totaled 5.3 million tons and was used primarily for roads (40.1%), in building construction, excluding dams (28.6%), in cement shaped products (11.2%), and in power industry construction, including hydroelectric dams (1.5%).

*Lime.*—Production of hydraulic lime in Switzerland decreased 18.2% to 112,574 tons in 1974; domestic consumption fell 17.2% and totaled 115,753 tons during the year.[52]

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[51] Verein Schweizerischer Zement-Kalk-und Gips-Fabrikanten (Association of Swiss Cement, Lime, and Gypsum Manufacturers). Annual Report, 1974. Zurich, Switzerland, 68 pp.

[52] Page 24 of work cited in footnote 51.

# The Mineral Industry of Other Areas of Africa

By Staff, Bureau of Mines

## CONTENTS



## BOTSWANA [1]

The mineral industry of Botswana has been a major factor in the transformation of the country's economy. The gross domestic product (GDP) was an estimated $194 million [2] in 1974, and a growth rate of 14% was projected to continue through 1978. Rapid expansion in recent years has been possible through major developments in the mining and livestock sectors, which promise to provide a base for future industrialization. Even so, a series of circumstances in 1974 dampened expansion plans. During the year, a fourfold increase in the price of imported oil played havoc with the economy, as did the effects of world inflation, which necessitated a substantial mid-1974 increase in wages and salaries. A drop in copper prices, severe technical problems at Selebi-Pikwe copper-nickel complex, and a lower-than-expected volume of diamond sales all resulted in lower-than-expected mineral revenues. Except for diamond, mineral production was far below expected levels.

Estimated government revenue expected for 1975–76 was $108.9 million, an increase of 26% over that of 1974, but down from the 1974 increase over that of 1973 of 56%. Recurrent government expenditures for 1975 were projected at 48% above those of 1974, reflecting the inflationary circumstances previously outlined. Total value for development projects in the current 5-year plan ending 1978–79

[1] Prepared by Janice L. W. Jolly, physical scientist, Division of Ferrous Metals.

[2] Where necessary, values have been converted from South African Rand (R) to U.S. dollars at the rate of R1=US$1.48.

was estimated to be $405.7 million. However, only $297.2 million was expected to be implemented during the plan period; $173.8 million was expected from external sources, leaving $123.4 million to be contributed from domestic sources.

Botswana sees foreign investment as a key factor in its development and actively seeks private capital for development of minerals, manufacturing industries, and agriculture. The income tax law of 1973 provides relief on capital expenditures. The constitution prohibits nationalization unless approved by the National Assembly, and guarantees prompt payment of adequate compensation. All investment proposals must be approved by the Government, but there are no other restrictions on private foreign investment and no limitation on repatriation of profits. Botswana is a member of the Southern African Customs Union with the Republic of South Africa, Swaziland, and Lesotho. When the road link with Zambia is completed in mid-1976, Botswana will have access to African countries north of the Zambezi. It was announced during 1974 that the Government would exercise its rights under a 1969 agreement with the De Beers organization to renegotiate certain aspects of the agreement, since the Orapa operations have proved much more profitable than originally envisaged. Negotiations have been going on since 1973. The Government would increase its shareholding in Orapa Mining Co. from 15% to 50% and replace the existing profits tax and 5% sales royalty with a single sales royalty, subject to future amendment. These new arrangements are likely to increase the Government's share to 75%.

In September 1974, it was announced that Botswana would have its own currency within 2 years and will phase out the Rand. The Government was also to establish a central bank to be responsible for foreign exchange control and to set the exchange rate for the new currency.

Under the current 5-year development plan, the road network has been a major focus of attention. The construction of all-weather roads has been aided by loans from the International Development Association (IDA), the United Kingdom, the Swedish International Development Authority (SIDA), and the U.S. Agency for International Development (AID). Canada loaned over $5 million for a road link with Zambia, which is to extend 530 kilometers from Francistown to Kazungula and is expected to be completed by mid-1977. The total cost was expected to be $50 million. The Government decided that the Rhodesian railway system in Botswana was to be taken over, and will eventually be owned and operated by Botswana.[3] The Federal Republic of Germany was added to the list of countries assisting Botswana in developing a modern transportation system. The Federal Republic of Germany was to lend about $5 million for the development of the Francistown-Serule Road, and give about $346,280 for design of the road.

Installed electrical capacity in 1973 included 12 megawatts at Gaborone, 15 megawatts at Selebi-Pikwe, 0.8 megawatts at Francistown, and 1.9 megawatts from the facilities controlled by the national company Botswana Power Corp. (BPC). The BPC capacity will be increased to 65 megawatts by 1978, when the power facilities at Selebi-Pikwe will add 45 megawatts. In addition, private industries have installed power capacities of about 39 megawatts. Most power is thermally produced. Total output of coal from the mine near Palapye was being used for the thermal powerplant at Selebi-Pikwe.

The Selebi-Pikwe copper-nickel complex started production in February 1974, on schedule 33 months after initiation of construction. Bamangwato Concessions Limited (BCL), the company that operates the concession, is owned 15% by the Government and 85% by Botswana Roan Selection Trust Ltd. (BRST). The public holds a 40% equity in BRST with the remaining 60% owned one-half by American Metal Climax, Inc. (Amax) and one-half by Anglo-American Corp. and Charter Consolidated Group. Delays and technical problems in 1974 brought the total financing for the project to over $286 million. The higher capital requirements were partially offset by higher prices for base metals in 1974, but lower-than-expected production and prices were encountered in 1975. The additional finance required was put up by the shareholders. The technical problems encountered were largely associated with the high proportion of fines in

[3] Standard Bank Review (London). Botswana. October 1974, p. 19.

the ore delivered to the mill. The record rainy season raised the moisture content of the ore, hampering the movement of ore through the mill's crushing section. Work stoppages also occurred owing to explosions during concentrate drying, which were caused by the pyrophoric nature of the concentrates. Production reached 6,262 tons of copper-nickel matte in 1974 and was averaging about 1,000 tons per month, well below the planned 3,500 tons per month. The matte was to be delivered to Amax's Port Nickel plant in Louisiana, where it would be refined. A team of engineers was moved to Pikwe to remain on-site until normal operations could be achieved. The underground mine at Selebi was not expected to enter production until 1979. An Outokumpu Oy flash smelter and a sulfur-reduction plant were teamed to produce and capture the highest attainable amount of sulfur from the ore. The 127,000 tons of byproduct sulfur expected to be produced yearly will be sold in southern Africa.

Prospecting continued at the Matsitama copper deposits. Reserves were estimated to be about 10 million tons with 2.5% copper. Promising copper deposits were also reported south of Lake Ngami with a possible production twice that of Selebi-Pikwe.

There was increasing acivity in the search for coal. A team from Powell Duffryn Technical Services Ltd. of the United Kingdom completed a preliminary survey in conjunction with the Botswana Geological Survey. It was understood that the team would make a complete survey of coal deposits throughout Botswana. Following the energy crisis, Botswana's substantial coal reserves have become a valuable asset. Shell Coal Botswana, a wholly-owned subsidiary of the Royal Dutch/Shell group, was awarded a special prospecting license in March 1974 to seek coal, oil shales, and radioactive minerals over an extensive area in eastern and southern Botswana. Shell's prospecting license covers three areas covering about 15,000 square kilometers total. The concession is for 3 years with extensions. The present production of about 200,000 tons per year from the Morupule coal mine was forecast to increase to 1 million tons per year after 1977.

Investment areas discussed during 1974 with various American firms included the possibility of a cement factory. The Foley gypsum deposits were expected to have a production of 50,000 tons per year, starting in 1976. Of this, about 2,000 tons were planned for use at a cement factory to be located near Selebi-Pikwe at Mandinare, and the rest were to be exported.

In 1974, the Orapa mine raised its diamond production from the 1973 level of 2,416,000 carats to 2,718,000 carats valued at $44.8 million. Approximately 85% was industrial. In 1973, Botswana's output contributed approximately 5% of the world production of diamonds. The Orapa mine was expected to be the largest in terms of quantity (carats) in the De Beers group, though the quality and therefore value per carat is relatively low. Intensive testing of the DK–1 pipe located 40 kilometers southeast of the Orapa deposit established that it was economic. The area is smaller than Orapa, but the diamonds are of higher quality. The DK–2 is a small satellite pipe similar to DK–1. DK–1 and 2 were to be called the Letlhekine mine. Terms for mining these new deposits were under negotiation.

A salt and soda-ash refinery and town were being planned at Sua Pan within the next 5 years. The project was to be a joint effort between the Government and possibly Makgadikgadi Soda Limited, a subsidiary of BCL. In early 1975, however, BCL suspended its program of developing the salt project and let its prospecting license lapse, allowing the Government to pursue other promising avenues. The Government was to be responsible for the infrastructure, and the mining company for the refinery and other plant requirements.

Botswana imports all of its petroleum needs from the Republic of South Africa and some distillate fuel oil from Nigeria. Botswana's oil imports were valued at $3.4 million in 1974. During the fuel crisis early in 1974, the country suffered a shortage after the decision by the Republic of South Africa to reduce deliveries to Botswana at the same time as Lesotho and Swaziland. It was decided to raise oil storage capacity in Botswana, giving it additional reserve for future emergencies. Approximately $74,000 was to be borrowed for construction of new oil storage depots at six centers throughout the country, increasing reserve capacity to a 2-month supply. The loan was expected to come from a special fund set up by oil-exporting members of the Arab league for the member states of the Organization of African Unity (OAU).

## Table 1.—Other Areas of Africa: Production of mineral commodities

| Country, commodity, and unit of measure [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **BOTSWANA [2]** | | | |
| Coal (not further described) ---- metric tons | -- | 15,532 | 32,732 |
| Copper matte, copper content ---- do | -- | e 1,400 | 2,380 |
| Diamond: | | | |
| Gem e ---- thousand carats | 360 | 362 | 408 |
| Industrial e ---- do | 2,043 | 2,054 | 2,310 |
| Total ---- do | 2,403 | 2,416 | 2,718 |
| Gem stones, semiprecious, rough, not further described ---- kilograms | 100,289 | 72,914 | 36,500 |
| Manganese ore and concentrate, gross weight ---- metric tons | 687 | 340 | 8 |
| Nickel matte, nickel content ---- do | -- | e 1,300 | 2,630 |
| **BURUNDI [2 3]** | | | |
| Lime ---- do | 150 | e 150 | e 150 |
| Rare-earth metals, bastnäsite concentrate, gross weight ---- do | 250 | -- | -- |
| Tin ore and concentrate: | | | |
| Gross weight ---- long tons | 154 | r e 140 | e 140 |
| Tin content ---- do | 111 | r e 100 | e 100 |
| **CAMEROON [2]** | | | |
| Aluminum metal, primary ---- metric tons | 46,200 | 44,123 | 46,842 |
| Cement, hydraulic ---- do | 164,461 | 191,648 | 201,399 |
| Gold, mine output, metal content ---- troy ounces | 50 | 83 | 64 |
| Stone: | | | |
| Limestone ---- metric tons | 29,200 | 49,270 | 49,193 |
| Marble ---- do | 800 | 1,200 | 1,096 |
| Tin ore and concentrate: | | | |
| Gross weight ---- long tons | 35 | 36 | 36 |
| Tin content ---- do | 24 | 24 | 24 |
| **CENTRAL AFRICAN REPUBLIC [2]** | | | |
| Diamond: | | | |
| Gem e ---- carats | 345,907 | 251,108 | 210,000 |
| Industrial e ---- do | 178,195 | 129,358 | 140,000 |
| Total ---- do | 524,102 | 380,466 | 350,000 |
| Gold e ---- troy ounces | 64 | 64 | 64 |
| **CHAD [2]** | | | |
| Natron: | | | |
| Slabs (plaques) ---- metric tons | 2,084 | 1,681 | 3,585 |
| Broken e ---- do | 5,000 | 2,400 | NA |
| **CONGO [2]** | | | |
| Copper, mine output, metal content ---- do | 1,371 | 927 | 930 |
| Fertilizer materials, potash, crude, $K_2O$ equivalent ---- do | 287,306 | 269,199 | 288,221 |
| Gas, natural: | | | |
| Gross production e ---- million cubic feet | r 2,900 | r 15,800 | 23,000 |
| Marketed production ---- do | r 535 | 552 | 664 |
| Gold, mine output, metal content ---- troy ounces | r 2,080 | 1,240 | 701 |
| Lead, mine output, metal content ---- metric tons | 473 | 1,340 | 1,663 |
| Petroleum, crude ---- thousand 42-gallon barrels | 2,510 | 15,361 | 22,434 |
| Zinc, mine output, metal content ---- metric tons | 2,153 | 3,495 | 3,366 |
| **DAHOMEY [2]** | | | |
| Salt (marine) ---- do | e 2,500 | e 2,500 | 2,500 |
| Stone, gravel ---- do | NA | NA | 15,000 |
| **ETHIOPIA [2 4 5]** | | | |
| Cement, hydraulic ---- do | 187,592 | 204,339 | 208,246 |
| Clays, kaolin ---- do | 26,584 | e 12,570 | e 130 |
| Copper, mine output: | | | |
| Gross weight ---- do | -- | 1,900 | 1,900 |
| Metal content e ---- do | -- | 130 | 130 |
| Gold, mine output, metal content ---- troy ounces | 20,784 | 19,575 | 15,754 |
| Gypsum and anhydrite, crude ---- metric tons | 4,650 | e 4,500 | 1,666 |
| Lime ---- do | 47,142 | e 11,230 | e 6,450 |
| Limestone ---- do | 167,786 | 98,523 | 16,198 |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels | 627 | 639 | 597 |
| Jet fuel and kerosine ---- do | 200 | 249 | 210 |
| Distillate fuel oil ---- do | 1,331 | 1,388 | 1,395 |
| Residual fuel oil ---- do | 1,558 | 1,596 | 1,464 |
| Other: | | | |
| Liquefied petroleum gas ---- do | 37 | 41 | 40 |
| Asphalt ---- do | 148 | 132 | 90 |
| Unspecified ---- do | 38 | -- | 6 |
| Refinery fuel and losses ---- do | 561 | 584 | 483 |
| Total ---- do | 4,500 | 4,629 | 4,285 |

See footnotes at end of table.

Table 1.—Other Areas of Africa: Production of mineral commodities—Continued

| Country, commodity, and unit of measure [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| ETHIOPIA [2 4 5]—Continued | | | |
| Platinum, mine output, metal content ——— troy ounces | 248 | 235 | 230 |
| Pumice ——— metric tons | 8 | 10 | -- |
| Salt: | | | |
| Rock ——— thousand metric tons | 10 | [e] 10 | -- |
| Marine ——— do | 281 | 107 | 122 |
| Total ——— do | 291 | 117 | 122 |
| Stone, limestone ——— metric tons | 167,786 | 98,523 | 16,198 |
| Talc ——— do | -- | -- | 3 |
| GUINEA [2] | | | |
| Aluminum: | | | |
| Bauxite, gross weight ——— thousand metric tons | 2,050 | 3,660 | 7,605 |
| Alumina ——— do | 663 | 615 | 636 |
| Diamond: | | | |
| Gem [e] ——— thousand carats | 25 | 25 | 25 |
| Industrial [e] ——— do | 55 | 55 | 55 |
| Total [e] ——— do | 80 | 80 | 80 |
| Gold, mine output metal content [e] ——— troy ounces | 4,000 | 4,000 | 4,000 |
| IVORY COAST [2] | | | |
| Cement, hydraulic ——— thousand metric tons | 583 | 600 | 630 |
| Diamond: | | | |
| Gem [e] ——— thousand carats | 134 | 120 | 112 |
| Industrial [e] ——— do | 200 | 180 | 167 |
| Total ——— do | 334 | 300 | 279 |
| Petroleum refinery products: | | | |
| Gasoline ——— thousand 42-gallon barrels | 1,505 | 1,750 | 2,023 |
| Jet fuel ——— do | 342 | 425 | 1,023 |
| Kerosine ——— do | 310 | 380 | |
| Distillate fuel oil ——— do | 2,206 | 2,534 | 3,081 |
| Residual fuel oil ——— do | 2,121 | 3,067 | 3,503 |
| Other ——— do | 446 | 81 | 93 |
| Refinery fuel and losses ——— do | 621 | 389 | 421 |
| Total ——— do | 7,551 | 8,626 | 10,144 |
| LESOTHO [2] | | | |
| Diamond: | | | |
| Gem ——— carats | 833 | 1,132 | 1,767 |
| Industrial ——— do | 8,186 | 7,455 | 8,540 |
| Total ——— do | 9,019 | 8,587 | 10,307 |
| MALAGASY REPUBLIC [2] | | | |
| Abrasives, natural: | | | |
| Corundum ——— kilograms | 3,000 | -- | -- |
| Garnet (industrial only) ——— do | 10,700 | 2,600 | 2,800 |
| Beryllium, beryl concentrate, industrial grade, gross weight metric tons | 9 | 3 | 13 |
| Cement, hydraulic ——— do | 64,177 | 69,863 | 61,447 |
| Chromium, chromite concentrate, gross weight ——— do | 111,770 | 157,714 | 155,874 |
| Clays, kaolin ——— do | 1,968 | 1,823 | 3,505 |
| Feldspar ——— do | 2 | 1 | 1 |
| Gem and ornamental stones: | | | |
| Agate ——— kilograms | -- | 12,600 | 60,200 |
| Amazonite ——— do | 1,200 | 1,500 | 6,800 |
| Amethyst: | | | |
| Gem ——— do | 2 | 4 | 9,100 |
| Geodes ——— do | 9,900 | 14,900 | |
| Apatite (ornamental only) ——— do | -- | 2,400 | 715 |
| Aragonite ——— metric tons | 1,268 | 219 | 648 |
| Beryl ——— kilograms | 2 | 4 | 2 |
| Calcite (ornamental only) ——— do | -- | -- | 6,000 |
| Celestine ——— do | 37,100 | 63,500 | 41,100 |
| Chalcedony ——— do | -- | 200 | 196 |
| Cipoline marble ——— metric tons | 521 | 600 | [r] 545 |
| Citrine, gem ——— kilograms | 10 | 22 | 20 |
| Diopside, gem ——— do | -- | 384 | -- |

See footnotes at end of table.

## Table 1.—Other Areas of Africa: Production of mineral commodities—Continued

| Country, commodity, and unit of measure [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **MALAGASY REPUBLIC [2]—Continued** | | | |
| Gem and ornamental stones—Continued | | | |
| Garnet: | | | |
| Gem ---------- kilograms -- | 24 | 62 | 16 |
| Other ornamental ---------- do ---- | 3,700 | 9,000 | 6,300 |
| Jasper ---------- do ---- | 270 | 500 | 31,300 |
| Labradorite ---------- do ---- | 12,500 | 56,600 | 8,400 |
| Opal ---------- do ---- | NA | NA | 500 |
| Quartz: | | | |
| Rose quartz ---------- do ---- | 158,900 | 165,100 | 300,800 |
| Geodes ---------- do ---- | NA | NA | 2,400 |
| Other ornamental ---------- do ---- | 18,600 | 37,400 | 3,400 |
| Rhodenite ---------- do ---- | 31,100 | 33,400 | 28,100 |
| Tourmaline: | | | |
| Gem ---------- do ---- | -- | 200 | ([3]) |
| Other ornamental ---------- do ---- | 4,700 | 7,500 | 1,200 |
| Gold, mine output, metal content ---------- troy ounces -- | 190 | 71 | 77 |
| Graphite, all grades ---------- metric tons -- | 18,155 | 13,963 | 17,280 |
| Mica, phlogopite: | | | |
| Block ---------- do ---- | 58 | 125 | 151 |
| Splittings ---------- do ---- | 341 | 566 | 551 |
| Scrap ---------- do ---- | 187 | 199 | 155 |
| Total ---------- do ---- | 586 | 890 | 857 |
| Petroleum refinery products: | | | |
| Gasoline ---------- thousand 42-gallon barrels -- | 1,062 | 1,198 | 1,148 |
| Kerosine and jet fuel ---------- do ---- | 490 | 618 | 620 |
| Distillate fuel oil ---------- do ---- | 1,195 | 1,365 | 1,306 |
| Residual fuel oil ---------- do ---- | 1,269 | 1,511 | 1,459 |
| Other ---------- do ---- | 92 | 128 | 116 |
| Refinery fuel and losses ---------- do ---- | 368 | 260 | 251 |
| Total ---------- do ---- | 4,476 | 5,080 | 4,900 |
| Quartz, piezoelectric ---------- kilograms -- | 2,100 | 400 | 368 |
| Rare-earth metals, ores and concentrates, bastnäsite, | | | |
| Stone: | 42 | -- | -- |
| gross weight ---------- metric tons -- | 21,000 | e 20,000 | e 20,000 |
| Salt, marine ---------- do ---- | | | |
| Calcite, industrial ---------- do ---- | 152 | 382 | 1,449 |
| Quartz, metallurgical ---------- do ---- | 153 | 17 | 105 |
| Zirconium, zircon concentrate, gross weight ---------- do ---- | 14 | -- | -- |
| Other, mineralogical samples, not further described --- do ---- | 700 | 922 | -- |
| **MALAWI [2 9]** | | | |
| Cement, hydraulic ---------- thousand metric tons -- | 74 | 85 | 81 |
| Gem and ornamental stone, agate ---------- metric tons -- | NA | 9 | 22 |
| Lime ---------- do ---- | 250 | 250 | 250 |
| Sodalite e ---------- do ---- | 2,400 | 2,400 | NA |
| Stone, sand and gravel: | | | |
| Limestone ---------- do ---- | 114,000 | 141,890 | 123,418 |
| Shale e ---------- do ---- | 100,000 | 100,000 | 100,000 |
| **MALI [2]** | | | |
| Gold, mine output, metal content ---------- troy ounces -- | e 30 | e 30 | -- |
| Salt e ---------- metric tons -- | 3,000 | 3,000 | 3,000 |
| **MAURITANIA [2]** | | | |
| Copper, mine output, metal content ---------- do ---- | r 14,825 | 21,277 | 20,079 |
| Gypsum ---------- do ---- | -- | 1,955 | 8,312 |
| Iron ore and concentrate, gross weight | | | |
| thousand metric tons -- | r 9,248 | 10,480 | 11,666 |
| Rare-earth metals, monazite concentrate, gross weight | | | |
| metric tons -- | 100 | 100 | 100 |
| Salt, marine e ---------- do ---- | 1,000 | 1,000 | 1,000 |
| **MAURITIUS [2]** | | | |
| Lime ---------- do ---- | 6,000 | e 6,600 | 4,000 |
| Salt, marine ---------- do ---- | 5,400 | e 5,900 | 5,000 |
| **NIGER [2]** | | | |
| Cement, hydraulic ---------- do ---- | 33,000 | e 33,000 | 20,500 |
| Gypsum e ---------- do ---- | 1,500 | 1,500 | 2,200 |
| Salt e ---------- do ---- | 4,000 | 4,000 | 2,000 |
| Stone, sand and gravel: | | | |
| Limestone, not further described ---------- do ---- | e 33,000 | e 33,000 | 40,000 |
| Gravel ---------- do ---- | NA | NA | e 100,000 |
| Sand ---------- do ---- | -- | -- | e 100,000 |
| Tin, mine output, metal content ---------- long tons -- | r 90 | 92 | 78 |
| Uranium concentrate, $U_3O_8$ content ---------- metric tons -- | 1,022 | 1,118 | 1,318 |

See footnotes at end of table.

## Table 1.—Other Areas of Africa: Production of mineral commodities—Continued

| Country, commodity, and unit of measure [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **RWANDA [2]** | | | |
| Beryllium, beryl concentrate, gross weight ____ metric tons | 103 | 95 | 62 |
| Columbium and tantalum ore and concentrate, gross weight: | | | |
| Columbite-tantalite ____ do | 38 | 33 | 37 |
| Columbite-tantalite-tin ____ do | -- | 587 | -- |
| Gas, natural: | | | |
| Gross [e] ____ million cubic feet | 35 | 35 | 35 |
| Marketed ____ do | 35 | [e] 35 | [e] 35 |
| Gold, mine output, metal content ____ troy ounces | NA | NA | 643 |
| Lithium minerals, amblygonite ____ metric tons | -- | 23 | NA |
| Tin, mine output, metal content [e] ____ long tons | 1,468 | 1,404 | 1,280 |
| Tungsten, mine output, metal content ____ metric tons | [r] 251 | 302 | 209 |
| **SENEGAL [2]** | | | |
| Cement, hydraulic ____ thousand metric tons | 335 | 296 | 332 |
| Clays: | | | |
| Fuller's earth (attapulgite) ____ metric tons | 3,089 | ([10]) | ([10]) |
| Other ____ do | 2,000 | NA | NA |
| Fertilizer materials, phosphatic: | | | |
| Crude: | | | |
| Aluminum phosphate ____ thousand metric tons | 165 | 219 | 406 |
| Calcium phosphate ____ do | 1,250 | 1,533 | 1,472 |
| Manufactured: | | | |
| Aluminum phosphate, dehydrated ____ do | 52 | 64 | 97 |
| Other [11] ____ do | 6 | 5 | 6 |
| Petroleum refinery products: | | | |
| Gasoline ____ thousand 42-gallon barrels | 988 | 874 | 851 |
| Jet fuel and kerosine ____ do | 776 | 805 | 872 |
| Distillate fuel oil ____ do | 1,183 | 1,077 | 985 |
| Residual fuel oil ____ do | 1,606 | 1,987 | 1,793 |
| Other ____ do | 54 | 44 | 31 |
| Refinery fuel and losses ____ do | 247 | 292 | 148 |
| Total ____ do | 4,854 | 5,079 | 4,680 |
| Salt ____ metric tons | 134,899 | 121,632 | 150,000 |
| Stone: | | | |
| Basalt ____ cubic meters | 55,738 | 81,500 | 83,929 |
| Marble (cipoline) ____ do | 375 | 380 | 120 |
| **SEYCHELLES ISLANDS [2]** | | | |
| Phosphate rock (including coral rock phosphate) metric tons | 9,217 | 7,112 | 3,541 |
| **SOMALIA REPUBLIC [2]** | | | |
| Salt, marine [e] ____ do | 2,000 | 2,000 | 2,000 |
| **SOUTHERN RHODESIA [2 12]** | | | |
| Antimony, mine output, nickel content [e] ____ do | 200 | 200 | 300 |
| Asbestos [e] ____ do | 80,000 | 80,000 | 100,000 |
| Beryllium, beryl concentrate, gross weight ____ do | 60 | 60 | 65 |
| Cement, hydraulic ____ thousand metric tons | 626 | 673 | [e] 700 |
| Chromium, chromite, gross weight [e] ____ do | [r] 550 | [r] 550 | 590 |
| Coal, bituminous [13] ____ do | 2,762 | 3,060 | 2,794 |
| Coke, metallurgical [13] ____ do | 297 | 237 | 267 |
| Columbium-tantalum minerals, tantalite, gross weight [e] metric tons | 40 | 40 | 40 |
| Copper: | | | |
| Mine output, metal content [14] ____ do | 35,917 | 41,821 | 39,295 |
| Metal: | | | |
| Smelter [14] ____ do | [r] 52,837 | 57,314 | 53,927 |
| Refined [14] ____ do | 30,000 | 30,000 | 30,000 |
| Fertilizer materials, crude phosphate rock ____ do | 110,000 | 150,000 | 130,000 |
| Fluorspar [e] ____ do | 150 | 150 | 180 |
| Gold, mine output, metal content [e] ____ troy ounces | 500,000 | [r] 550,000 | 640,000 |
| Iron and steel: | | | |
| Iron ore, gross weight [e] ____ thousand metric tons | 500 | 500 | 500 |
| Pig iron and ferroalloys [e] ____ do | 290 | 290 | 300 |
| Crude steel [e] ____ do | 200 | [r] 250 | 300 |
| Lithium minerals, gross weight [e 15] ____ metric tons | [r] 15,000 | [r] 15,000 | 15,000 |
| Magnesite [e] ____ do | 20,000 | 20,000 | 20,000 |
| Nickel: | | | |
| Mine output, metal content [e] ____ do | 12,000 | 11,800 | 12,000 |
| Smelter production [e 16] ____ do | 10,000 | 10,000 | 10,000 |
| Pyrite: | | | |
| Gross weight ____ thousand metric tons | 73 | 73 | 75 |
| Sulfur content ____ do | 30 | 30 | 30 |
| Silver, mine output, metal content [17] ____ thousand troy ounces | 126 | 169 | 156 |
| Stone, industrial limestone [e] ____ thousand metric tons | 700 | 700 | 750 |
| Tin: [e] | | | |
| Mine output, metal content ____ long tons | [r] 590 | 590 | 590 |
| Smelter ____ do | [r] 590 | 590 | 590 |
| Tungsten, mine output, metal content [18] ____ metric tons | 151 | 154 | 91 |

See footnotes at end of table.

## Table 1.—Other Areas of Africa: Production of mineral commodities—Continued

| Country, commodity, and unit of measure [1] | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **SPANISH SAHARA [2]** | | | |
| Fertilizer materials, crude phosphate rock, thousand metric tons | 150 | 696 | 2,300 |
| **SUDAN [2]** | | | |
| Cement, hydraulic, do | 159 | 208 | 300 |
| Chromium, chromite concentrate, gross weight, metric tons | 23,083 | 32,050 | 20,000 |
| Gold, mine output, metal content, troy ounces | 95 | 49 | 309 |
| Gypsum and anhydrite, crude, metric tons | [r e] 15,000 | [r e] 20,000 | 30,000 |
| Magnesite, crude [e], do | 100 | 100 | 100 |
| Mica, all grades, do | NA | NA | 250 |
| Petroleum refinery products: | | | |
| Gasoline, thousand 42-gallon barrels | 863 | 904 | 964 |
| Jet fuel, do | 642 | 728 | 344 |
| Kerosine, do | 132 | 144 | 248 |
| Distillate fuel oil, do | 2,431 | 2,576 | 2,641 |
| Residual fuel oil, do | 1,650 | 1,950 | 1,439 |
| Other, do | 2,042 | 1,787 | 2,197 |
| Refinery fuel and losses, do | 383 | 490 | |
| Total, do | 8,143 | 8,579 | 7,833 |
| Salt [19], metric tons | 60,000 | 75,030 | 50,000 |
| **SWAZILAND [2 20]** | | | |
| Asbestos, chrysotile, do | 28,683 | 39,632 | 32,421 |
| Barite, do | 150 | 116 | 296 |
| Clays, kaolin, do | 2,177 | 1,602 | 2,236 |
| Coal, bituminous, do | 126,035 | 140,386 | 116,481 |
| Iron ore, direct shipping, gross weight, thousand metric tons | 2,566 | 2,013 | 2,481 |
| Stone, quarry product, cubic meters | 45,337 | 46,245 | NA |
| Talc (pyrophyllite), metric tons | 108 | 126 | 36 |
| Tin, mine output, metal content, long tons | -- | -- | [8] |
| **TOGO [2]** | | | |
| Cement, hydraulic (ground from imported clinker), metric tons | 116,800 | 118,050 | 127,772 |
| Clays for brick production, do | NA | 8,317 | 6,247 |
| Fertilizer material, phosphate rock, beneficiated product, thousand metric tons | 1,928 | 2,272 | 2,572 |
| Salt, metric tons | [e] 100 | [e] 100 | 120 |
| Stone: | | | |
| Marble: | | | |
| Dimension stone, do | NA | 1,240 | 2,233 |
| Broken, do | NA | 1,864 | |
| Granite, do | NA | 1,098 | NA |

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the countries listed individually in this table, Equatorial Guinea, the French Territory of the Afars and Issas, the Gambia and Upper Volta, all covered textually in this chapter, presumably produce modest quantities of crude construction materials such as clays, stone, sand, gravel, and may produce minor amounts of other mineral commodities (most notably gypsum, lime, and salt), but output is not reported quantitatively and available information is inadequate to permit formulation of reliable estimates of output levels.

[2] In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials, (including clays, stone, sand, and gravel) presumably were produced, but output is not reported quantitatively, and available information is inadequate to permit formulation of reliable estimates of output levels.

[3] Limited quantities of tungsten minerals, columbite-tantalite and other pegmatite minerals may also be produced, but output is not recorded.

[4] Includes production of the Province of Eritrea.

[5] In addition, Ethiopia excluding Eritrea produces clay for the manufacture of bricks. Clay output for this purpose is unreported, but brick production was as follows (number of bricks): 1972—not available; 1973—1,846,652; 1974—575,326.

[6] Production of the Province of Eritrea only; additional quantities may be produced in other areas of Ethiopia.

[7] Reported as marble, without the modifying term cipoline.

[8] Less than ½ unit.

[9] In addition to the commodities listed, corundum and kyanite may also be produced, but output is not recorded.

[10] Not reported in gravimetric units; output totaled 3,727 cubic meters in 1973 and 4,810 cubic meters in 1974.

[11] Products marketed under the trade names of "baylifos" and "phosphal."

[12] In addition to the commodities listed, corundum (natural), graphite and mica have been produced in the past and output presumably has continued, but no basis for estimation of output levels is available. Through 1965, natural corundum output was at a level of several thousand tons, ranking Southern Rhodesia second only to the U.S.S.R.

[13] Data are sales for years ended August 31 of that stated.

[14] Data are for years ended September 30 of that stated.

[15] Data presented are 1964 total recorded production, rounded; eucryptite, lepidolite, petalite and spodumene were all produced in 1964. No reliable basis exists for estimating either individual output levels for these minerals or total output on a year-to-year basis.

[16] Includes nickel content of nickel oxide and nickel fonte.

[17] Output of Inyati mine only for years ended September 30 of that stated.

[18] Output of Beardmore mine only for years ended September 30 of that stated.

[19] Erroneously reported in previous edition; data presented therein were in thousand 42-gallon barrels, not metric tons as indicated.

[20] All figures reported are sales; actual production not reported.

## BURUNDI [4]

The mineral industry of Burundi was of minor importance to the national economy. Activity was highlighted in 1974 by the confirmation by a United Nations Development Program (UNDP) mineral survey team, that extensive commercially exploitable nickel deposits occur in the eastern and southern part of the country. The deposits, reportedly the largest in Africa, are garnierite-type lateritic cappings on ultrabasic rocks. Significant copper, cobalt, and platinum mineralization was also found in the rocks below the nickel laterites. Drilling delineated large tonnages of 2% nickel ores at Musongati and Nyabikere. UNDP exploration continued on these and other nickel deposits along a 30-kilometer zone of basic and ultrabasic rocks between the towns of Rutana and Mabanda, and was expected to be completed in 1975.

The UNDP planned to conduct a $2 million economic study beginning in 1975 on the feasibility of developing the deposits. The cost of exploiting the nickel deposits, including extensive hydroelectric and processing facilities and a complete transportation infrastructure, was roughly estimated at $500 million.[5] International mining companies have expressed interest in these deposits, but at yearend 1974, no mining concessions had been granted by the Government.

Inflation, transportation problems, and high petroleum prices adversely affected Burundi's economy in 1974. Both the balance of payments and the balance of trade registered deficits, and owing to low coffee prices, export earnings declined 11.5% to $27.8 million. Agricultural products accounted for virtually all of the export earnings; mineral products, largely tin and rare-earth concentrates, comprised about 2.5% of the total export value, or about $695,000, in 1974. Imports of mineral commodities were primarily iron and steel semimanufactures, refined petroleum products, cement, and salt.

Mineral production in 1974 was limited to small tonnages of bastnäsite (a rare-earth mineral) and cassiterite (tin) concentrates, lime, small quantities of placer gold, and unmeasured amounts of peat and common construction materials such as stone, sand, gravel, and clay. Bastnäsite was produced at a small underground mine near Karonge by Société Minerale de Karonge (SOMIKA). Statistical data on mineral production are not available, but bastnäsite output was probably less than 300 tons. Cassiterite was produced by SOMIKA at a mine in Muyinga Province near the Rwanda border. Tin production in 1974 was estimated at about 140 tons. In September, the two mining companies, Minetain Burundi and SOMIKA, merged into an enterprise, Sobumines, in which the Government owns 49%.

Interest in exploring for oil and gas in the Ruzizi River plain and Lake Tanganyika continued. Preliminary studies and possible drilling by the U.S. company, International Subsea Development Corp., were expected to begin in 1975.[6]

## CAMEROON [7]

The minerals industry of the Federal Republic of Cameroon followed the pattern of previous years, with only limited production of gold, limestone, marble, and cassiterite reported. Primary aluminum metal was produced from alumina imported from Guinea. Hydraulic cement also was produced. The trade pattern was similar to that of 1973. Only small quantities of metallic and nonmetallic minerals were exported although significant quantities of aluminum metal, cement, and scrap metal were exported.

Imports included aluminum oxide, iron and steel semimanufactures, cement, fertilizer materials, mineral fuels, and other metallic and nonmetallic mineral commodities.

Although current mineral production in Cameroon is small, there are known deposits of bauxite, kyanite, iron ore, and

[4] Prepared by James H. Jolly, physical scientist, Division of Nonferrous Metals.

[5] Where necessary, values have been converted from Burundi francs (FBu) to U.S. dollars at a rate of FBu78.35 = US$1.00.

U.S. Embassy, Bujumbura, Burundi. Economic Trends Report. State Department Airgram A–24, Apr. 4, 1975, p. 6.

[6] Quarterly Economic Review. Zaire, Rwanda, Burundi. No. 4, 1974, p. 15.

[7] Prepared by Benjamin Petkof, physical scientist, Division of Nonferrous Metals.

sand that may be developed in future years. Bauxite deposits are known at Minim and Martap, and additional deposits are at Dschang and Fongo Tongo. Kyanite deposits are known to occur at Otele, Nanga Eboko, and Edea. Low-grade hematite has been found at Kribi.

There has been limited prospecting for oil in Cameroon, with the following companies holding operating permits: Société Elf de Recherches et d'Exploitation des Petróles du Cameroun (Elf-Serepca), Cameroonian Shell Prospecting and Exploiting Co. (Shell Camrex), Gulf Oil Company of Cameroon, Mobil Oil, Niegria Inc., and Oceanic Exploitation Co. These companies hold 12 concessions in the Cameroonian coastal basin.

Efforts are being made to develop known natural gas reserves at Logbaba.

## CENTRAL AFRICAN REPUBLIC [8]

The mineral resources of the Central African Republic remained largely underdeveloped because of lack of investment capital and inadequate means of transport. Diamond continued as the major mineral product during 1974 with a total value of $10 to $15 million. Total trade was estimated at not more than $100 million. The balance of payments for 1974 was estimated at a $15 million deficit, owing partly to the high cost of imported petroleum products. A number of foreign-owned businesses were nationalized in 1974, including five petroleum-product-distribution firms. Prospects increased for construction of a 700-ton-per-year uranium concentrator, which could begin as early as 1976.

**Government Policies and Programs.**—The Central African Republic nationalized a number of foreign-controlled businesses including some French cotton and forest-product interests as well as five petroleum-product-distribution companies, two of which (Mobil and Texaco, Inc.) were U.S. firms. No compensation had been made by yearend for these acquisitions. Nevertheless, foreign investment in mineral ventures was actively sought by the Government. Total U.S. investment, primarily in diamond mining and cutting, was $7.5 million. France continued as the heaviest foreign investor in the country. Foreign aid was received from the U.S.S.R., Romania, and the European Development Fund.

### PRODUCTION AND TRADE

Diamond production continued as the major minerals industry in the Central African Republic, accounting for over 95% of mineral export value and approximately one-third of total export value. Estimated diamond production, shown in table 1, declined 8% in 1974 to 350,000 carats. No reliable figures were available on the value of 1974 mineral production. Total value of diamond production in 1973 was $10.9 million. World prices of gem-quality diamond increased significantly during 1974. No change was indicated in the previously reported production ratio of two parts gem diamond to one part industrial diamond. A small quantity of gold, less than 100 troy ounces, was produced as a byproduct of diamond mining.

Building-material output included crushed stone, sand and gravel, and brick and ceramic tile. Production figures were not available.

Diamond export data were not available; the Government considered all export data as strategic information not to be released.

Financial problems in the Central African Republic continued to increase, and the projected (November) balance of payments for 1974 was minus $15 million. Sharp increases in the price of petroleum imports affected the balance of trade adversely, and it was estimated that they would cost the country an extra $7.6 million in 1974.

### COMMODITY REVIEW

**Diamond.**—No expansion of diamond-mining capacity was reported in 1974, and production decreased 8% to 350,000 carats. Total employment was approximately 50,000. Resource exploration and foreign investment were encouraged.

[8] Prepared by Richard H. Singleton, physical scientist, Division of Nonmetallic Minerals.

Diamond mining continued as the major investment by the United States in the Central African Republic.

**Petroleum.**—Demand for petroleum products was estimated to be 84,000 cubic meters per year. This had been imported from Gabon prior to 1974, and about 15,000 cubic meters had been reexported to Chad. Most of the 1974 supply was purchased on credit from Algeria. Difficulties with transportation and payment threatened the oil supply during the year. The Algerian trade pact became mutually unacceptable by yearend, and the Central African Republic planned to turn again to Gabon's refinery at Sogara for its supply of petroleum products.

All five petroleum-product-distribution companies were nationalized in May 1974 and their functions taken over by the Central African Society of Hydrocarbons, a state-owned controlling body. Petroleum exploration was begun in the northern part of the country, but no drilling was undertaken in 1974.

**Uranium.**—Prospects increased for commercial development of high-phosphate uranium ore at Bakouma, 500 kilometers east of the capital, under an exclusive contract with Swiss Aluminium, Ltd. (Alusuisse). Estimated reserves were 15,000 tons of uranium. Planned investment was reportedly $8 million to build a plant with a capacity of 700 tons per year of concentrate, by 1976 at the earliest.

**Other Minerals.**—No further reports were available on building the cement and fertilizer plants, or on developing the iron ore deposits as reportedly planned in 1972 and 1973.

The UNDP proposed another mineral survey of the country. Preliminary satellite exploration indicated large deposits of heavy metals.

## CHAD [9]

The mining industry of Chad is quite small, with sun-dried natron (actually trona or hydrous sodium carbonate) the main mineral commodity produced. It is generally obtained as slabs weighing about 35 kilograms from about 20 saliferous basins northwest of Bol, near Lake Chad. Natron has a variety of uses, including human and animal consumption, preservation of meat and hides, and the manufacture of soap. Production data are shown in table 1.

The Continental Oil Company of Chad (CONOCO-Tchad), in which Shell Oil Co. has a 50% interest, has been searching for oil in Chad since 1969. Some evidence of oil was found at a well north of Lake Chad in Kanem prefecture in August to September 1974, but further tests and exploration were said to be necessary before the economic feasibility of the discovery could be determined. Two earlier wells were drilled in southern Chad, in Logone Oriental and Chari-Baguirmi prefectures. After drilling a fourth well in Kanem prefecture, plans were to transfer the rig south again for two additional wells.[10]

A mineral exploration project was begun in November 1973 with the assistance of 3-year UNDP financing. Exploration is to be concentrated in a 10,000-square-kilometer area of Mayo Kebi in southwestern Chad. Work was begun on setting up basic laboratory testing facilities along with the continuing preliminary exploration.[11]

## CONGO [12]

Petroleum was the major mineral product of the Congo. Potash continued to be the major nonfuel mineral commodity, followed by lead-zinc and copper ores.

Potash, mostly for export, was mined from a high-grade sylvanite deposit (60% $K_2O$) by Compagnie des Potasses du Congo (CPC). The revised sylvanite reserves of 1.5 million tons located in Hollé were expected to be depleted by 1976. Studies were being conducted on the feasibility of mining large deposits of carnallite when the Hollé sylvanite reserves are exhausted. At Pointe Noire, CPC planned to dredge the

[9] Prepared by Michael J. Potter, physical scientist, Division of Nonmetallic Minerals.
[10] U.S. Embassy, N'Djamena, Chad. State Department Airgram A–63, Nov. 19, 1974, p. 13.
[11] U.S. Embassy, N'Djamena, Chad. State Department Telegram 1376, June 4, 1975, 2 pp.
[12] Prepared by Ronald J. DeFilippo, physcial scientist, Division of Nonferrous Metals.

harbor, construct a wharf to accommodate larger ships, and build new railroad transfer facilities.

The U.S.S.R. assisted in the exploration and development of deposits of lead-zinc-copper ore in the Mfouati region. Two basic areas of mineralization occur—one in the Yanga-Koubenza area, and the other in the Djenguile area. National Mines Company of Mfouati, established in 1974 as a government-owned minerals exploitation organization, planned to mine the Djenguile deposit where reserves were estimated at 350,000 to 400,000 tons of ore. Later it will mine the Yanga-Koubenza deposit where reserves were estimated at 4.1 million tons. It was estimated that production of a low-grade lead-zinc concentrate would average about 30,000 tons per year during 1975–78 and 20,000 tons per year thereafter. Production of a copper concentrate was estimated to be about 4,000 tons per year. A mill and flotation plant were being built with a capacity of 65,000 tons per year. The cost for bringing the Djenguile mine and mill onstream was estimated at about $4.1 million,[13] about one-half contributed by the Government and one-half by a material credit from the U.S.S.R.

Construction began on facilities to mine the gold deposits of the Sounda-Kakamoeka sectors (Kouilou region) as part of the U.S.S.R.-Congolese agreement of November 1972. Production of 24,000 troy ounces per year of gold was expected from the 5-ton-per-day mill. Reserves were estimated at 145,000 troy ounces of gold. National Mines Co. of Sounda was established to operate the mine. Total investment to equip the mine was estimated at $1.1 million to which was added $60,000 as technical assistance. Financing was insured by a credit from the U.S.S.R.

The Congolese Government gave first priority in its 1974–78 budget to improving transportation facilities. Line improvements and equipment purchases were needed to increase the capacity of the Congo Ocean Railroad from 3.8 million tons in 1973 to 5 million tons by yearend 1974. Increased capacity was needed by the railroad to transport a minimum of 2 million tons per year of manganese ore from southern Gabon to Pointe Noire.

In 1974, 22.4 million barrels of crude oil[14] was produced exclusively from the Emeraude Field, where 28 platforms were put into service by drilling 20 additional wells. Elf-CONGO and Azienda Generale Italiani Petroli S.p.A. (AGIP) of Italy operated the field. The Government projected that crude oil production from the Emeraude Field would decline at an average annual rate of 23% from 1974 to 1978, at which time production was estimated to be 7.9 million barrels. Crude oil production schedules called for decreased production in 1975; however, the schedules also indicated an increase to almost 50 million barrels by 1978 from all fields.

The Italian exploration team, AGIP-Recherches Congo, spent more than $22 million for exploration during 1969–74. AGIP's main discovery was the Loango-Marine Field where one production, three drilling, and one flare platform were to be completed by mid-1975. Approximately 34 production wells and 8 water-injection wells were planned for the field. AGIP also had a permit for offshore prospecting in the Maritime Madingo Field, an area of 3,415 square kilometers. The total investment for exploration and development was estimated at about $150 million. A 60-mile pipeline was being laid from the platforms to Djeno where storage tanks and port facilities were under construction. Gas reserves were estimated at 400 million cubic meters. All gas production was used to supply the Hollé steam-generating station.

Construction was scheduled to begin in 1975 for a 21,500-barrel-per-day refinery at Brazzaville.

## DAHOMEY[15]

The mineral production of Dahomey consisted of small amounts of salt, gravel, and cement for local consumption in 1974. Plans were being implemented for a ceramics plant in Cotonou, a cement works at Onigbolo, a marble works at Dadjo, and an oil refinery at Porto Novo. New interest was being shown in the Union Oil

[13] Where necessary, values have been converted from Communauté Financière Africaine Francs (CFAF) to U.S. dollars at the rate of CFAFI=US$0.0041.

[14] Converted at 7.206 barrels per ton of crude oil.

[15] Prepared by Janice L. W. Jolly.

Co.'s concession after their contract was revoked in early 1974. Agriculture remained the cornerstone of development, and the industrial sector remained relatively undeveloped. Large enterprises, both private and public, were financed mainly by foreign capital. France provided an estimated 40% of all bilateral and multilateral aid given to Dahomey. Much of the economy remained open to private capital, but private investment remained scarce, and the State was trying to establish public and semipublic companies. Nationalization of several companies occurred with announcement of a new change in government policy at the end of 1974. Along with higher prices for petroleum products, Dahomey also experienced higher prices for its imported food and manufactured products during 1974, causing the Government to take several steps to combat inflation by instituting price subsidies and increasing wages. The 1974 Government budget of $56.5 million[16] had an estimated deficit of $4.5 million. Civil service costs absorb about 66% of the Government budget expenditure.

Early in 1974, a hydrocarbon-supply commission was established to study the problems relating to the supply of liquid and gaseous hydrocarbons, including a regular inspection of reserves. On December 4, the petroleum distribution companies were nationalized, with certain banking, insurance, transportation, industrial development, and communications companies soon to follow. A new state society was created, Société Nationale de Commercialization des Produits Petróleirs (SONACOP), to commercialize and industrialize petroleum and its derivatives.[17] The stated governmental policy of giving Dahomeans the transport monopoly was implemented by the formation of the national transport and consignment company SONTRAC in early January 1975; 49% of the capital was held by the state, and 51% was divided between Dahomean shippers. A new profits tax was passed in July 1974 with a generally favorable reaction from local businesses. Those businesses subject to special indirect taxes such as distributors of cement and petroleum products were now able to deduct profit taxes from other tax obligations. The contribution to the National Development Fund, established in 1973 for reinvestment of profits, became obligatory after January 1, 1974, in the form of "investment certificates" subscribed to by taxpayers.

In 1974, Dahomey imported refined petroleum products from Algeria (145,254 tons). and Niger (66,678 tons). The Société Nationale de Raffinage (SONARAF) was created in July 1973 between the Dahomean State and British companies, Litwin Ltd. and Inha International Ltd. to build and develop a petroleum refinery in Dahomey. Funds to proceed with the project were being sought from the Ex-Im Bank and Nigeria. With cancellation of the Union Oil contract in early 1974, several other concerns, including a Romanian delegation, were showing interest in further exploration and possible exploitation. A new exploration agreement was signed in early 1975 with Shell Oil Co. of Dahomey (Dahorex). Under the new mining and petroleum code of 1973, a prospecting company has no guarantee of an exploitation license and can only make application for an exploration permit after it has discovered a commercially exploitable field.

The Société Nationale de Ceramique (SONAC) ceramics plant, located at Contonou, was expected to start in early 1975, and was a joint effort between the Dahomean State (80%) and a West German company (20%). The project necessitated an investment of about $2.1 million. A cement works was planned for Onigbolo with aid from the Nigerian Government. A loan of about $8.3 million was to be advanced by Nigeria in 1975 with a view to developing a number of projects of common interest, including the cement factory.[18] A joint development project was discussed between Niger and Dahomey at yearend 1974. Projects considered were extending the railway from Parakou to Dosso and Niamey, constructing a dam across the Mekrou River, and constructing the Gay-Malanville bridge.

The UNDP continued its program of helping the Government to strengthen the Geological Survey by establishing a geochemical laboratory and initiating a reconnaissance geological survey of the country with a contribution of $550,000.

[16] Where necessary, values have been converted from Communauté Financière Africaine Francs (CFAF) to U.S. dollars at the rate of CFAF240 = US$1.00.

[17] Industries et Travaux D'Outremer (Paris). Dahomey. V. 23, No. 254, January 1975, p. 71.

[18] Industries et Travaux D'Outremer (Paris). Dahomey. V. 23, No. 259, June 1975, p. 521.

UNDP was also to provide $234,000 to the international agency, Council of the Communaté Electrique du Benin (CEB), in order to further develop electrical energy resources. CEB was created by Dahomey and Togo in 1968 to buy and transport electricity from Ghana for both nations. Ghana has agreed to make available 50 megawatts of electricity for a continuous period of 115 years from the Akosombo power station.[19]

In January 1973, the Dahomean electrical company was nationalized and the government-owned Société Nationale d'Electricite et d'Eau (SDEE) was organized in its place. The total installed electrical capacity of four thermal power stations at Cotonou, Porto-Novo, Bohicon, and Parakou was about 10.6 megawatts in 1974.[20] In 1973, the total electrical energy consumed was 41.6 million kilowatt-hours, which was about 84% of that available.

There was a shortfall in the production of salt in 1974 because SODASEL, the only company recovering salt from seawater, had difficulty in getting production underway. It attained only about one-half of its production goal with about 2,500 tons of salt. Recent field research has confirmed earlier evidence of small, apparently noncommercial phosphate deposits in southern and central Dahomey. There are no concrete plans at present to exploit these deposits.[21] About 15,000 tons of gravel was also produced.

## EQUATORIAL GUINEA [22]

The mineral industry of Equatorial Guinea, including its two provinces, Rio Muni and Fernando Po, consisted primarily of petroleum prospecting and various mineral imports for 1974. Merchants Petroleum of Los Angeles, Calif., acquired a 5% interest in Aracca Petroleum's exploration rights in Rio Muni Province. Drilling plans were not disclosed. A nation of an estimated 350,000 people, the gross national product (GNP) has reportedly grown at a rate of 8% and reached $240 per capita, one of the highest in western Africa.[23] Equatorial Guinea had 360 kilometers of highway put in by the Spanish before their departure. The country produced 23 million kilowatt-hours of electricity in 1973. A World Bank loan of $2 million was made in 1973 to be devoted to the development of a highway maintenance program.

## ETHIOPIA [24]

Ethiopia's mineral industry continued to make a minor contribution to the general economy in 1974. Mineral production, not including refined oil products, was valued at approximately $12.8 million[25] in 1974, forming less than 1% of the estimated GDP of $2.4 billion. In January, the first copper was shipped to Japan from the Nippon Mining Co., Ltd. concession in Eritrea, but this activity was suspended by March, because of continuing civil disturbances. Tenneco Ethiopia, Inc. and the Polar Bear/Voyager Group also halted their exploration activities, while the Whitestone Group and Royal Dutch/Shell Group continued. In light of Eritrean objection to mineral exploitation licensed by the Ethiopian Government, little activity was expected in Eritrea in the near future.

Of major significance was the announcement by the Ethiopian Government on December 20, 1974, of the intent to pursue a socialist economic policy. This intent was better defined in a series of declarations in early 1975. Mineral activities exclusively reserved for the State were listed as large-scale salt mining, petroleum refining and natural gas, exploitation of precious metal and radioactive minerals, and certain basic industries such as ce-

[19] The Financial Times (London). Ghana. July 30, 1975, No. 26731, p. 4.
[20] Industries et Travaux D'Outremer (Paris). Dahomey. V. 22, No. 253, December 1974, p. 1107.
[21] U.S. Embassy, Cotonou. Department of State Airgram A-47, May 28, 1975, 2 pp.
[22] Prepared by Janice L. W. Jolly.
[23] Marches Tropicaux et Mediterraneens (Paris). Political Disturbances and Lack of Technical Assistance: Equatorial Guinea's Growing Pains. May 2, 1975, pp. 1294–1295.
[24] Prepared by Janice L. W. Jolly.
[25] Where necessary, values have been converted from Ethiopian dollars (Eth$) to U.S. dollars at the rate of Eth$2.05=US$1.00.

ment. Areas where Ethiopian State and foreign capital could jointly operate included exploration and exploitation of petroleum and coal, and mining of ferrous and nonferrous minerals and chemical and fertilizer materials. The State would assume 51% of any such venture. Quarrying stone and related materials was left to the private sector, subject to regulation.[26]

Minerals produced in 1974 included marine salt ($4.5 million), cement ($5.3 million), gold ($2.3 million), copper ore ($473,170), platinum ($41,935), marble ($47,741), china clay, gypsum, sand and silica sand, stone, granite, talc, and lignite. Minerals produced in Eritrea included 90,000 tons of cement, 130 tons of china clay, 6,450 tons of lime, and 8,327 tons of limestone for 1974.[27]

The total value for exports in 1974 was estimated to be $319.2 million. Mineral exports including marine salt ($290,243) and refined petroleum products ($8.5 million) formed about 3% of the total value for items exported. Generally the export earnings were reduced by about 8%[28] from those in 1973, compared with a 44% increase in 1973 over that of 1972. The most striking cost increase in imports for 1974 was that of crude and refined petroleum products. Total imports were valued at an estimated $280.8 million. Ethiopia's oil import bill was estimated at $47.9 million in 1974, up from the $16.9 million required in 1973.

The Ethiopian Petroleum Co.'s refinery at Assab processed about 581,402 tons of crude oil in 1974, but has been reportedly operating at a loss which has made it necessary to consider subsidizing its operations. Besides the refinery production, Ethiopia also imports refined petroleum products as well as crude oil. A total of 110,112 tons of refined petroleum products was imported in 1974. Most petroleum was imported from Saudi Arabia and Iran. Higher refinery costs (about $200,000 per year) also contributed to higher prices for petroleum products during 1974.

In December 1974, Tenneco Ethiopia, Inc. and the Polar Bear/Voyager Group (composed of Voyager Petroleum Ltd., 25%; Polar Bear International Ltd., 25%; Cardinal Petroleum Ltd., 25%; and Houston Oils Ltd. of Canada, 25% announced their withdrawal from Ethiopian oil exploration, principally because of a lack of substantial discoveries. Tenneco had continued to operate three seismic crews throughout 1974. The Voyager Petroleum Group relinquished its Ogaden Basin permit after completion of a gravity survey. Whitestone Ethiopia (Whitestone International and Louisiana Land and Exploration Co.) was completing its first stage of geological and geophysical activities that began in 1973. The second stage of exploration was expected to begin in 1975 with drilling possible sometime in 1976. Royal Dutch/Shell was prospecting along the Eritrean coast, southeast of Massawa. Shell acquired the offshore concession in July. Shell's oil prospecting permit was for 12 years, requiring an investment of about $10 million. General American Oil Company of Ethiopia Inc. (GAO) acquired a 31% interest in Red Sea acreage that will eventually be reduced to 617,000 acres. Thus far, GAO has drilled two dry holes.

An increased number of prospecting permits and exploration licenses were reportedly granted during the year.[29] Strengthened by a UNDP-financed project, the Geological Survey also saw an increase in activities during 1974. Canadian, Japanese, and Chinese-aided geological and mineral surveys were also active. Artena Corp. continued studying the lateritic nickel deposits in Sidamo Province. Gold continued to be produced from the Government gold mine in Sidamo Province, and exploration for placer gold in western Wollega continued with encouraging results. A preliminary assessment of these deposits should be complete during 1975. Copper exploration continued at Tigre and a number of mineralized zones have been located. Test drilling was to begin on disseminated copper in metavolcanics. Large deposits of diatomite are also under study, as are industrial minerals for local glass and cement companies. Exploration was also active for other industrial minerals such as soda ash, fluorite, borates, and phosphates, as well as for base metals. Some beryl and wolframite occurrences have been staked by prospectors in northern Harrar Province.

[26] National Bank of Ethiopia (Addis Ababa). Quart. Bull., v. 1, No. 1, March 1975, pp. 4–5.
[27] American Embassy, Addis Ababa. Department of State Telegram No. 486, August 5, 1975, 1 p.
[28] Page 44 of work cited in footnote 26.
[29] Mining Annual Review. Ethiopia. June 1975, p. 433.

In March 1974, work was stopped at the Ethio-Nippon Debarwa copper mining site in Eritrea. In January, 1,900 tons of copper had been exported to Japan. Other copper deposits of equally high quality are also reported in this mineral concession. The Ethiopia Railroad in northern Eritrea continued to show declines in both freight and revenue during 1974. In early 1974, the railroad was affected by a coal shortage as a result of Australian coal strikes as well as by antiquated equipment.

Table 2.—Ethiopia: Exports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum metal, unwrought and semimanufactures | 11 | -- |
| Copper matte | -- | 47 |
| Iron and steel metal: | | |
| Scrap | 260 | 233 |
| Semimanufactures | 7 | -- |
| Tin including alloys, all forms long tons | (1) | -- |
| Zinc including alloys, all forms | 167 | -- |
| Other, ash and residue containing nonferrous metals | 2 | 72 |
| NONMETALS | | |
| Cement | 22,548 | 36,999 |
| Clays and clay products (including all refractory brick) | 576 | 288 |
| Lime | 64 | 250 |
| Salt and brine | 82,495 | 171,257 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude and partly worked | 689 | 128 |
| Worked | (1) | 2 |
| Sand, excluding metal bearing | 2 | 12 |
| Other nonmetals, n.e.s.: | | |
| Slag, dross and similar waste, not metal bearing | 151 | 50 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 164 | 49 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Carbon black and gas carbon | 27 | 32 |
| Coal | -- | 15 |
| Gas, hydrocarbon, manufactured | 21,169 | 90,828 |
| Petroleum refinery products: | | |
| Gasoline thousand 42-gallon barrels | -- | 3 |
| Distillate fuel oil do | 508 | 214 |
| Lubricants do | (1) | -- |
| Mineral jelly and wax do | (1) | 1 |

[1] Less than ½ unit.

Table 3.—Ethiopia: Imports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum including alloys, all forms | r 562 | 885 |
| Arsenic trioxide, pentoxide, acids | 21 | 68 |
| Copper: | | |
| Copper sulfate | 983 | 429 |
| Metal including alloys, unwrought and semimanufactures | 48 | 32 |
| Iron and steel metal: | | |
| Scrap | -- | 4,060 |
| Pig iron, including cast iron | 20 | -- |
| Sponge iron, powder, shot | 4 | -- |
| Spiegeleisen | -- | 40 |
| Steel, primary forms | 619 | 3,309 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections | 6,069 | 6,361 |
| Universals, plates, sheets | r 23,714 | 23,685 |
| Hoop and strip | 528 | 33 |
| Rails and accessories | 503 | 824 |
| Wire | 1,012 | 714 |
| Tubes, pipes, fittings | 3,151 | 2,000 |
| Castings and forgings, rough | 32 | 64 |
| Total | 35,009 | 33,681 |

See footnotes at end of table.

## Table 3.—Ethiopia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS—Continued | | |
| Lead including alloys, all forms | 56 | 44 |
| Manganese oxides | 10 | -- |
| Mercury 76-pound flasks | r 1 | 1 |
| Nickel including alloys, all forms | r 21 | 2 |
| Silver metal including alloys troy ounces | 772 | -- |
| Tin including alloys, all forms long tons | r 364 | 661 |
| Titanium oxides | 19 | 10 |
| Zinc: | | |
| Oxide | 15 | 22 |
| Metal including alloys, all forms | 579 | 350 |
| Other: | | |
| Ash and residue containing nonferrous metals | 3 | 4 |
| Oxides, hydroxides and peroxides of metals, n.e.s | 108 | 40 |
| Metals including alloys, all forms | 13 | 2 |
| NONMETALS | | |
| Abrasives, natural, n.e.s | 137 | 107 |
| Barite and witherite | 10 | -- |
| Cement | 503 | 309 |
| Chalk | 6 | 2 |
| Clays and clay products (including all refractory brick): | | |
| Crude clays, n.e.s | 10 | -- |
| Products | 1,635 | 1,098 |
| Fertilizer materials: | | |
| Crude: | | |
| Nitrogenous | 1 | -- |
| Phosphatic | 100 | -- |
| Potassic | 25 | 15 |
| Other | 394 | 1,052 |
| Manufactured: | | |
| Nitrogenous | 3,141 | 2,881 |
| Phosphatic | 391 | 3,377 |
| Potassic | 100 | -- |
| Other | 13,737 | 41,810 |
| Ammonia | 31 | 11 |
| Graphite, natural | 2 | 71 |
| Gypsum and plasters | (1) | (1) |
| Mica, all forms | -- | 1 |
| Pigments, mineral: | | |
| Natural, crude | 125 | 62 |
| Iron oxides, processed | 19 | 63 |
| Salt and brine | 141 | 195 |
| Sodium and potassium compounds, n.e.s.: | | |
| Caustic soda | 3,180 | 2,492 |
| Caustic potash, sodic, potassic peroxides | 34 | 650 |
| Stone, sand and gravel: | | |
| Dimension stone: | | |
| Crude and partly worked | 53 | 6 |
| Worked | 34 | 156 |
| Gravel and crushed rock | -- | 8 |
| Sand, excluding metal bearing | 1 | 47 |
| Sulfur: | | |
| Elemental, all forms | 899 | 258 |
| Sulfuric acid | 280 | 1,041 |
| Talc | -- | 49 |
| Other nonmetals, n.e.s.: | | |
| Crude | r 104 | 148 |
| Slag, dross, and similar waste, not metal bearing | 1,050 | 83 |
| Oxides and hydroxides of magnesium, strontium, barium | 11 | 4 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 291 | 393 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Asphalt and bitumen, natural | 7 | -- |
| Carbon black | 75 | 78 |
| Coal, coke, including briquets | 14 | 187 |
| Gas, hydrocarbon, manufactured | 13 | 23 |
| Petroleum: | | |
| Crude thousand 42-gallon barrels | 2,935 | 3,492 |
| Refinery products: | | |
| Gasoline do | 95 | 68 |
| Kerosine do | 56 | 62 |
| Jet fuel do | 159 | 296 |
| Distillate fuel oil do | 155 | 162 |
| Residual fuel oil do | (1) | (1) |
| Lubricants do | 33 | 30 |

See footnotes at end of table.

Table 3.—Ethiopia: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | |
| Petroleum—Continued | | |
| Refinery products—Continued | | |
| Other: | | |
| Liquefied petroleum gas ------- thousand 42-gallon barrels -- | (1) | (1) |
| Mineral jelly and wax ---------- do ---- | 34 | 71 |
| Nonlubricating oils, n.e.s ---------- do ---- | 5 | 2 |
| Bituminous mixtures, n.e.s.[2] ---------- do ---- | 4 | 1 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals -- | 66 | -- |

r Revised.
1 Less than ½ unit.
2 Includes petroleum bitumen, petroleum coke and other residues.

## THE FRENCH TERRITORY OF THE AFARS AND ISSAS [30]

Mineral industry activity in the French Territory of the Afars and Issas contributed very little to the economy of the nation in 1974. Mineral trade consisted primarily of imports and reexports. Petroleum products, cement, metals, and semimanufactured metal products head the import list. The principal mineral activity in 1974 consisted of exploratory work for a geothermal source of energy. Recent high petroleum prices have made this source of energy seem more economically attractive. It was estimated that each borehole drilled in the otherwise barren basalt fields could furnish 10 megawatts, or reportedly one-third of the electricity consumed in Djibouti. The reopening of the Suez Canal and events in Ethiopia have resulted in a rise in importance of the strategically located port Djibouti. A salt works was also being planned for Djibouti.[31]

## THE GAMBIA [32]

Gambia, a country with 494,279 people and a GDP of approximately $63 million, had negligible mineral production in 1974. Mineral activity has been reported, however, in exploration for deposits of kaolin, ilmenite, and oil. Small amounts of unrecorded sand and gravel were produced for local consumption. Gambia and Iceland signed a letter of intent for a joint venture in construction of an ilmenite-processing plant in Gambia and a smelting plant in Iceland, contingent upon success of feasibility studies being carried out by the UNDP. The deposits were estimated to contain about 5 million tons of black sands. The Shell Oil (50%) and Pecten Gambia (50%) group was granted offshore (492 square miles) and onshore (554 square miles) oil exploration licenses. The Aracca Petroleum Company of New York had its exploration license renewed. Both companies have done seismic work. Shell began clearing for onshore seismic work in 1974, starting near the southern Senegal border and working north towards Banjul (formerly Bathurst). Merchants Petroleum Co. of Los Angeles acquired a 5% interest in Aracca's exploration rights in Gambia. No drilling plans were disclosed. Terra Resources of Tulsa, Okla., and five other oil companies had an option on 6,480 square kilometers offshore. Seismic data were being evaluated.

At yearend 1973, an Austrian firm, VÖEST-Alpine, Montan AG submitted a feasibility study for an oil refinery. The conclusions reached were favorable. In April 1974, the United Nations undertook a separate study of the project and indicated that it should probably be a joint venture with an oil-producing country. The refinery would probably have a yearly productive capacity of 1 million tons, and a capital investment of $73 million [33] was visualized.

Work on the Banjul port development was expected to be complete at the end of 1974, adding a deepwater port 9 meters deep and 122 meters long, and new transit sheds. The first phase of the UNDP hydrological and topographic study of the Gambia River was nearing completion in 1974. A total of 289 kilometers of asphalt-

30 Prepared by Janice L. W. Jolly.
31 Industries et Travaux D'Outremer (Paris). Afars et Issas. V. 21, No. 235, June 1973, p. 563.
32 Prepared by Janice L. W. Jolly.
33 Where necessary, values have been converted from Gambian dalasi to U.S. dollars at the rate of Gambian 1 dalasi = US$0.587.

surfaced roads and 523 kilometers of all-weather gravel roads existed in Gambia in 1974.

Foreign trade in mineral commodities consisted principally of imports of cement, iron and steel items, refined petroleum products, and fertilizers. A trade agreement was signed between Gambia and Liberia in which Gambia would import timber, cement, petroleum products, and beverages while exporting cattle and peanut oil to Liberia. Petroleum products represent between 3.5% and 4.5% of the total import values.

## GUINEA [34]

Bauxite and alumina were the principal mineral products of Guinea, and exports of these commodities continued to be the country's major source of foreign exchange.

Estimated bauxite production in Guinea more than doubled in 1974. It was the first full year of production at the Boké project operated by Guinea Bauxite Co. (CBG), and output by this venture alone exceeded 4 million tons. CBG was owned by the Government of Guinea (49%) and Halco (51%), a consortium of aluminum producers consisting of Aluminum Co. of America, 27%; Alcan Aluminium Ltd., 27%; Martin Marietta Aluminum, Inc., 20%; Péchiney Ugine Kuhlmann (PUK), 10%; Vereinigte Aluminium-Werke A.G. (VAW), 10%; and Montecatini-Edison S.p.A., 6%.

Bauxite was also mined by Friguia, which continued to operate the only alumina plant in Africa. Friguia was owned by the Government (49%) and Frialco Co. (51%), another international consortium. Frialco was owned by Olin Corp. (38.5%), PUK (36.5%), British Aluminium Co., Ltd. (10%), Alusuisse (10%), and VAW (5%). Late in the year, Olin sold its equity in Frialco to Noranda Mines, Ltd., which has a primary aluminum plant in the United States.

A third bauxite producer, the Government's Kindia Bauxite Office (OBK), began mining the deposits at Debele in the Kindia region in 1974. This project was initiated with the technical assistance and financing of the U.S.S.R. All of the production, which was expected to reach 2.5 million tons per year, was to be exported to the U.S.S.R.

The Government and Alusuisse joint venture, Société Minière et de Participations Guinée-Alusuisse (SOMIGA), was reportedly developing bauxite deposits in the Tougué region. Alusuisse reported that prospecting revealed over 2 billion tons of commercial-grade bauxite in this area. Another potential producer, Dabola Bauxite Co. (SBD), expected to complete feasibility studies in 1975 on its project near Dabola. SBD was a joint venture of the Governments of Guinea and Yugoslavia.

Extensive iron ore deposits occur at Mount Simandou in southeastern Guinea and in the Nimba Mountains adjacent to the Liberian deposits mined by Liberian-American-Swedish Mining Co. (LAMCO). A multinational company, Miferugui-Nimba, was formed to develop the Nimba deposits. The Government of Guinea, three other African countries, and a group of European and Japanese companies have reportedly underwritten all of the shares of Mifergui-Nimba. A similar company was expected to be formed to develop the Simandou deposits. Initially, ore from the Nimba project is to be shipped over the rail system used by LAMCO and exported from Buchanan, Liberia. Further plans include extension of the Conakry-Kankan railroad so that ore can be shipped from Nimba and Simbandou through Guinea to Conakry.

## IVORY COAST [35]

The mineral industry of the Ivory Coast remained of minor importance to the country's economy. Diamond production, the only significant mining activity, decreased 7% in volume owing to the closing of an obsolete plant. It was evident that diamond production, valued at about $7 million,[36] would remain the major mining activity throughout the seventies. Petroleum refin-

[34] Prepared by Horace F. Kurtz, industry economist, Division of Nonferrous Metals.
[35] Prepared by Richard H. Singleton.
[36] Where necessary values have been converted from Communauté Financière Africaine Francs (CFAF) to U.S. dollars at the rate of CFAF236=US$1.

ing and cement production continued using imported raw materials. Expansions in capacity were underway in both of these industries. The petroleum refining and distribution industries were partially nationalized with formation of government-industry jointly owned companies. Drilling for offshore oil continued with reasonable optimism.

The Ivorian economy performed surprisingly well in 1974 in spite of the oil crisis and worldwide inflation and recession. The GDP, at $3.73 billion, showed a real growth of 13% compared with an average of 7% for the previous 4 years. Actual GDP increased 55%. High prices prevailed throughout the year for cocoa and coffee, the two major commodities. Real industrial production increased 9%. Total export value increased 58% to $1.24 billion, 71% of which was cocoa, coffee, and timber. The balance of trade showed a $0.25 billion surplus, nearly double that of 1973. France was the main trading partner. About 7% of Ivorian trade was with the United States. External indebtedness increased 57% to $1.12 billion. Wholesale prices increased 19%.

Efforts to moderate inflation and further increase production were hindered by price increases for imports and the depressed economic status of developed countries. In an attempt to broaden the mineral industry, free enterprise and foreign investment in natural resource ventures was encouraged. In May 1974, total foreign investment was $442 million. The U.S. investment was $39 million, two-thirds of which was in petroleum, but which also included a diamond mine and a battery factory. After a modest depression, the Government was prudently expectant of an upturn at year-end.

A second major hydroelectric project with a capacity of 210 megawatts was scheduled for completion in 1979. The Government strived to lessen dependency on imported oil by developing water power.

Construction of a large pellet-producing, iron ore mine-concentrator complex was scheduled to begin in 1976. The project, planned to include a railroad and port, was to be the largest venture ever undertaken in the Ivory Coast.

Plans were made to exploit a gold deposit. Exploration was conducted for other metals and extensive nickel deposits were discovered.

**Government Policies and Programs.**—The Government continued to encourage free enterprise and foreign investment, which had been responsible for the country's economic success. Partial domestic ownership of foreign companies was encouraged, however, and by yearend the State owned 30% of the oil refinery and 50% of one of the petroleum-product-distribution companies. Training and promoting Ivorian citizens in industry was encouraged. The Government strived for independence from foreign-oil importation by development of state-owned hydroelectric power dams. Phasing out thermal-electric power units and commissioning the 180-megawatt Kossou-dam unit on the Bandama River in 1973 boosted the hydroelectric capacity to 69% of the country's total 325-megawatt capacity. A second major dam on the Bandama River, the Taabo project with a capacity of 210 megawatts, was scheduled for completion in 1979. Construction was scheduled to begin in 1975.

Mineral exploration continued in the northern and western portions of the country, including a second series of aerial explorations by Kenting Earth Sciences Ltd. under a Canadian loan. Searches for nickel in the Biankouma and the Syola regions and for placer gold in the Loho Basin were emphasized. Deposits of nickel, gold, molybdenum, and zinc were discovered. Promising deposits containing 1.5% to 1.8% nickel were found in the Biankouma area. The Sipouli nickel deposit was estimated to cover at least a 20-square-kilometer area. No exploitation plans were reported in 1974 for these deposits. Foreign investment in jointly owned mineral facilities was encouraged although all minerals were state-owned. Buildings of railroads and ports in cooperation with industry was encouraged. Drilling for offshore oil continued in 1974 without success.

## PRODUCTION

Diamond production continued as the only significant mining activity in the Ivory Coast. Production decreased 7% from 1973 to 278,500 carats because an obsolete factory was closed in 1974. No further production decrease was anticipated for 1975. Total value of 1974 diamond production was estimated to be about $7 million.

Production of cement, using imported clinker, decreased 5% to 630,000 tons. Its

estimated value was on the order of $25 million. Nearly all of it was used domestically. Expansion of production facilities was begun in view of anticipated increased demand caused by new construction programs.

Petroleum refinery output increased 18% to 1,340,000 tons, using crude oil imported from the Middle East and Nigeria. Total value of the refined product was estimated to be approximately $150 million. Refinery capacity was 1.5 million tons and was being raised to 2.0 million tons.

Data on production of stone and sand and gravel were not available.

## TRADE

Total export value increased 58% to $1.24 billion, mainly because of higher prices for coffee and cocoa. The three major exported commodities—cocoa, coffee, and timber, in order of value—constituted 71% of total export value. Cocoa became the leading commodity, primarily at the expense of timber. France continued as the major customer, with 26% of total export value, followed by the Netherlands, with 16%, double that of 1973. The United States received 7.1% of Ivorian exports compared with 5.6% in 1973. Diamond exports increased 1% to 291,291 carats valued at approximately $7 million. Approximately 275,000 tons of refined petroleum products, primarily motor gasoline and diesel fuel, valued at approximately $30 million was exported to nearby African countries, mainly Mali and Upper Volta, more than tripling the 1973 export volume.

Total import value increased 53% to $984 million despite a decrease in volume. Major imports were equipment, finished and semifinished goods, and crude petroleum. France remained the major exporter to the Ivory Coast, accounting for 39% of Ivorian imports compared with 44% in 1973. The United States supplied 6.9% of Ivorian imports compared with 9.0% in 1973. Crude petroleum imports, from the Middle East and Nigeria, increased 18% in volume to 1,377,000 tons, and more than quadrupled in value to approximately $140 million. A small quantity of this crude petroleum, approximately 21,000 tons, was reexported to neighboring countries. A small quantity of refined petroleum products, approximately 37,000 tons, was imported. Approximately 521,000 tons of clinker, with an estimated value of $2 million to $3 million, was imported from France, Spain, and the United Kingdom (in order of volume) for domestic cement manufacture. In addition, 130,000 tons of portland cement was imported, mainly from France. A small amount of cement, 18,000 tons, was exported. Various chemical fertilizers, totaling 101,000 tons and with an estimated value of about $4 million, was imported. Approximately 10% of this chemical fertilizer was reexported.

The balance of trade surplus, $252 million, was nearly double that of 1973.

**Table 4.—Ivory Coast: Trade in selected mineral commodities**
(Thousand metric tons unless otherwise specified)

| | Exports | | Imports | |
|---|---|---|---|---|
| | 1973 | 1974 | 1973 | 1974 |
| Crude petroleum | -- | 19 | 1,164 | 1,377 |
| Petroleum products | 80 | 275 | 130 | 37 |
| Cement | 9 | 18 | 132 | 130 |
| Cement clinker | -- | -- | 482 | 521 |
| Gypsum | -- | -- | 37 | 27 |
| Diamond ---- thousand carats | 287 | 291 | -- | -- |
| Fertilizers | -- | 10 | 87 | 101 |

## COMMODITY REVIEW

**Metals.**—*Gold.*—Bureau de Recherches Géologiques et Minieres, (BRGM), a consortium led by the French, signed an agreement with the Government to jointly exploit the Ity deposit west of Man. A total of 66 tons of ore had been collected by August. Assays ran up to 0.006% gold. Beneficiation studies were in progress. Planned plant capacity was 40,000 to 50,000 ounces of gold per year.

*Iron Ore.*—An agreement between the Government and the Man Iron Ore Consortium, leading to exploitation of the Mt. Klahoyo iron ore deposits near Man, was signed in November. Pickands Mather and Co., the project management member of the international consortium, contracted Kaiser Industries Corp. to undertake the engineering study, scheduled for completion in March 1976. The complex was to include a mine and concentrator, with an annual output of 12 million tons of pellets. Construction was scheduled to begin late in 1976, and production was to begin in 1980. The Government chose an electric railroad instead of the consortium-proposed slurry pipeline as the means of transport from Man to the port of Pedro, a distance of 300 kilometers. Costs of constructing the railroad and port was to be shared by government and industry. This was the largest project ever undertaken in the Ivory Coast and reportedly was to cost approximately $1 billion. It was estimated that the deposit contains an equivalent of 350 million tons of iron ore pellets.

The Government announced plans for building a 100,000-ton-per-year iron-smelting complex at San Pedro by 1980. The plan included direct reduction facilities using natural gas and a rolling mill.

**Nonmetals.**—*Cement.*—Two companies, Société Ivorienne des Ciments et Matériaux and Société des Ciments d'Abidjan, have been manufacturing cement in Abidjan since the mid-sixties. Their combined clinker-crushing capacity was reported to be 900,000 tons. Because of projected increases in construction activity, the former company announced plans to begin building a 180,000-ton-per-year cement plant in 1975 at San Pedro at a cost of $3 million.

*Diamond.*—The major diamond producer, Société Anonyme de Recherches et d'Exploitation Minières en Côte d'Ivoire (SAREMCI) had closed one of its three plants late in 1973 because of age and outdated equipment. Equipment modification of its plants allowed SAREMCI to produce 205,642 carats in 1974 or 74% of total domestic production. However, SAREMCI's production decreased 16% below that of 1973. The other 26% of domestic production came from Société West African Selection Trust and Harry Winston, Inc. (WATSON) whose output increased 30% over that of 1973. Both diamond companies explored for new deposits during 1974. Total inventory for both companies was 26,266 carats at yearend.

**Mineral Fuels.**—*Petroleum.*—Fifty percent of Shell-British Petroleum's Ivorian oil-distribution system was nationalized late in 1974. A permit was awarded in January 1975 to a multinational consortium operated by Phillips Petroleum Co. for offshore exploration of a 19,000-square-kilometer area. Estimated cost of this exploration was $45 million over 10 years. Offshore drilling continued through 1974 with some encouraging signs, but no positive discovery of exploitable deposits.

## LESOTHO [37]

The mineral industry in Lesotho received some good news in 1974 when a plan to develop a diamond mining operation at Letseng-la-Terai was announced. De Beers Consolidated Mines and the Government of Lesotho reached an agreement in early 1975 whereby De Beers would develop and open a mine in approximately 2 years. The decision terminated 2 years of negotiations, which had been preceded by several years of unsuccessful exploration.

No other mining developments occurred, but exploration continued for additional mineral resources. The first oil well was drilled in a series of wildcats planned by Westrans Petroleum, Inc., in a large area of southern and western Lesotho. The Canadian Government committed $972,000 in aid during 1975 for use in an aeromagnetic survey and other programs.[38]

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[37] Prepared by David G. Willard, economist, Division of Nonmetallic Minerals.

[38] Engineering and Mining Journal. Exploration Round-up. V. 176, No. 9, September 1975, p. 237.

It was evident that mineral developments would be desirable to offset other factors affecting the economy. Rising import costs, particularly for fuel, worsened the country's already negative balance of trade. Disturbances in the South African mines, where many of Lesotho's men were employed, forced the Government to consider taking over the recruitment of workers in order to better insure their safety and suitable working conditions.[39]

### PRODUCTION AND TRADE

Diamond remained Lesotho's only recorded mineral product in 1974. Production was estimated to have increased 32% to 11,307 carats in 1974 from 8,587 carats in 1973. (Only export figures were available, but all of Lesotho's production was exported). Diamond output remained at only about 60% of that in the peak 1966–70 period because the two largest diamond pipes, Letseng-la-Terai and Kao, remained closed to native diamond diggers in order that the Government might promote their development by mining companies. The proportion of production stone quality increased from 13% in 1973 to 16% in 1974. This, plus a sharp increase in gem-diamond prices, caused the value of diamond production in 1974 to soar 175% to $1.1 million from $400,00 in 1973.

Small quantities of other gem stones and construction materials were also produced, but no production statistics were available.

Aside from diamond, no figures on mineral trade were available for Lesotho for 1973 or 1974. Exports of mineral-related products other than diamond were believed to be minor. Rising costs for petroleum products probably offset the increase in diamond export values, leaving Lesotho with a negative balance in mineral trade.

### COMMODITY REVIEW

**Diamond.**—After several years of unsuccessful exploration and negotiations, a contract was signed that should result in commercial diamond production at Letseng-la-Terai, Lesotho's richest diamond pipe. De Beers Lesotho Mining Co., Ltd., a subsidiary of De Beers Consolidated Mines of South Africa that was formed to develop and operate the mine, was owned 75% by De Beers and 25% by the Government of Lesotho. A second company was being formed in Lesotho to market the product, although international distribution was to be handled by De Beers' central selling organization. A surface mine with a capacity of 4,000 tons per day of ore, a recovery plant, and a new road into the previously isolated mountain were scheduled for development, at a total cost of approximately $35 million. About 500 workers were to be employed. Preliminary construction was underway, and mine startup was targeted for early 1977. Between 62.5% and 72% of the revenue (depending on profitability) would accrue to the Lesotho Government through taxes and profit shares.[40]

No activity or negotiations were reported by the Kao diamond pipe, which had been inactive since exploration by Newmont Mining Corp. and United States Steel Corp. terminated in 1973.

The year's only production was by native diggers at the Liqhobong and Limpane pipes.

**Petroleum.**—Drilling of the first in a series of exploratory oil wells was begun by Westrans Petroleum, Inc. The company held exploration rights covering a large portion of southern and western Lesotho and had agreed to drill nine wells during 1974–82.[41]

## MALAGASY REPUBLIC[42]

The economy of the Malagasy Republic is basically agricultural, with 40% of the country's 7.5 million people engaged in subsistence agriculture. A small industrial sector dominated by petroleum refining, food processing, cotton textile, and cement provides only a limited market for indigenous minerals. Therefore, mineral industry activity is generally limited to commodities with export markets. Mineral industry activity was increasing, but accounted for only approximately 5% of total 1974 exports. Marketing Malagasian products continued to be difficult because of geographical location and logistical difficulties. The

[39] Mining Journal. Lesotho Labour Recruitment. V. 282, No. 7730, Mar. 15, 1974, p. 198.
[40] U.S. Embassy, Maseru, Lesotho. State Department Airgram A–18, April 4, 1975, pp. 1–2. Mining Journal. De Beers Plans Diamond Mine. V. 282, No. 7729, Mar. 8, 1974, p. 171.
[41] Oil and Gas Journal. Westrans Drilling First Lesotho Test. V. 72, No. 35, Sept. 2, 1974, p. 19.
[42] Prepared by W. Timothy Adams, Physical scientist, Division of Nonmetallic Minerals.

economic situation remained relatively stagnant because of uncertainty over the extent of Government intervention in the economic sector.

Increased prices for graphite and chromite in 1974 will probably be offset by decreased shipments. Although local demand for refined petroleum products can be met by the refinery at Tamatave, increased costs of crude petroleum will greatly increase the overall trade deficit. A technical and economic evaluation of the Manantenia bauxite deposits was completed, but development of this resource is unlikely at this time. Evaluation of iron, lateritic nickel, and ilmenite and zircon sands continued. Oil prospecting continued both onshore and offshore in 1974, with only minor shows of oil or gas. Increasing costs of the supporting infrastructure decreased the possibility of developing coal deposits in the south.

The Canadian Government has agreed to undertake a feasibility study for the Rogez Hydroelectric Project on the Vohitra River. The Canadian Government is expected to loan $10 million, the Japanese Government $20 million, and the World Bank $40 million of the estimated $70 million cost of the project. Power generated by the project could be used to process chromite to ferrochrome and exploit the Ambatovy nickel deposits.

**Government Policies and Programs.**—Since 1972, the Government has pursued a policy of rapidly enlarging its control over and direct participation in the economy. A number of sectors, including mining and energy, are now reserved exclusively for the State, or for State-dominated enterprises. The new Military Directory, which came to power in February 1975, has not yet defined its economic policy in detail, but has declared "it is prepared to collaborate with businessmen who respect its objectives." Since mid-1974, there were no major new initiatives toward further State participation in the economy, but the Government has moved to further initiatives taken earlier, and to improve the performance of new State enterprises.

New private investment in Malagasy has been very limited owing in large part to uncertainty concerning the extent of the State's eventual participation in the economy. Also, incentives in the Investment Code promulgated in 1973 have been inadequate to attract much interest.[43]

The National Military Office for Strategic Industries was established January 1, 1975. The mission of the new office is supervision of all exploration or exploitation of mineral resources of military or strategic character, particularly uranium and radioactive minerals, petroleum, and bituminous materials.[44]

The Malagasy Republic agreed to adopt statutes establishing the East African Mineral Resources Development Center at Dodoma, Tanzania. The center will advise participating governments about mineral developments, carry out feasibility studies, run training courses, provide laboratory services, undertake field work in mineral developments, and collect and publish information and data.[45]

The Malagasy Republic Government has on several occasions declared its willingness to welcome foreign investment. In most sectors of the economy, there are no set programs for attracting foreign investment and each case is considered individually. In the mineral sector, the Government has declared a policy of requiring majority State ownership in all new ventures. Firms examining investment possibilities in the mineral sector should be prepared to work in close collaboration with the Government, with the latter having a controlling interest in any new venture.[46]

## PRODUCTION

During 1974, mineral production was maintained substantially at 1973 levels. The performance of the mineral industry reflected continued marketing difficulties, uncertainty over the Government's economic policies, and the general decline of the world economy. Chromite, graphite, and mica continued to be the primary minerals produced.

Value of mineral production increased about 175% to an estimated $57.4 million in 1974 from $20.9 million (revised) in 1973. Petroleum refinery production value accounted for most of the increase, as the price of crude petroleum input increased

[43] U.S. Embassy, Tananarive, Malagasy Republic. State Department Airgram A-049, May 30, 1975, pp. 4–5.
[44] U.S. Embassy, Tananarive, Malagasy Republic. State Department Airgram A-001, Jan. 9, 1975, pp. 1–2.
[45] U.S. Embassy, Addis Ababa, Ethiopia. State Department Airgram A-94, May 28, 1975, p. 1.
[46] U.S. Embassy, Tananarive, Malagasy Republic. State Department Airgram A-049, May 30, 1975, p. 1.

from approximately $2.80 per barrel in 1973 to approximately $11.50 per barrel in 1974. Crude petroleum processed was approximately 5 million barrels in 1974.

Chromite production declined slightly to 156,000 tons. Cement production declined approximately 12% to 61,000 tons. Mica declined about 4% to about 857 tons. Graphite production increased 24% to about 17,000 tons, with the value increasing about 19%. In general, production of abrasives, feldspar, gem, semiprecious, and ornamental stones remained approximately the same. Statistics are unavailable on the production of building material for domestic consumption (stone, sand, and gravel).

## TRADE

Mineral exports in 1973 increased slightly over those of 1972. The value of mineral commodity exports paralleled worldwide price increases. Shipments of chromite concentrate were 97,952 tons valued at $2.4 million, down from 117,900 tons and $3.4 million in 1972. Exports of graphite decreased 4% in quantity and increased 2% in value; mica increased 57% in quantity and 40% in value; and gem, semiprecious, and ornamental stones increased 23% in value.

Crude petroleum imports in 1974 increased only 1% to 4.912 million barrels, but 12% in value to $13,813 million. Value of the total commodity trade and mineral commodity trade 1971–73 was as follows, in million dollars:

| | 1971 | 1972 | 1973 |
|---|---|---|---|
| Total commodity trade: | | | |
| Exports | 147.0 | 167.0 | 186.0 |
| Imports | 214.0 | 207.0 | 188.0 |
| Balance | −67.0 | −40.0 | −2.0 |
| Mineral commodity trade: | | | |
| Exports | 12.0 | 14.8 | 17.4 |
| Imports | 30.4 | 32.9 | 34.0 |
| Balance | −18.4 | −18.1 | −16.6 |

Source: Statistiques Du Commerce Exterieur De Madagascar. V. 2, issues for 1971, 1972. V. 1, 1973.

Tight governmental controls over imports reduced the mineral commodity trade deficit to less than expected and almost equalized the total commodity trade balance. The balance of mineral trade in 1974 was expected to decline.

Although prices of chromite, graphite, and mica were expected to increase, quantities exported were expected to decrease. The decline in demand for these minerals, coupled with the rise in crude petroleum prices, was expected to increase the trade deficit. Uncertainty over the extension of government's role in proposed policies and programs increased reluctance to invest in new mineral ventures. Marketing and transportation difficulties also were a contributing factor. Increased petroleum refinery capacity was capable of meeting local demands. A decrease in imports of refined petroleum products in conjunction with continued strict import controls was expected to minimize the mineral commodity trade deficit.

Detailed statistics on the mineral commodity trade are given in tables 5 and 6.

## Table 5.—Malagasy Republic: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum metal including alloys, all forms | (1) | (1) |
| Beryl ore and concentrate | 48 | -- |
| Chromite | 117,885 | 97,952 |
| Copper metal and alloys: | | |
| Unwrought and scrap | 230 | 249 |
| Semimanufactures | (1) | (1) |
| Iron and steel: | | |
| Scrap | 3,761 | 18 |
| Semimanufactures | 271 | 674 |
| Lead: | | |
| Oxide | 46 | 91 |
| Metal including alloys, all forms | 6 | 5 |
| Silver metal including alloys, all forms ---- troy ounces | 8,038 | -- |
| Tin metal including alloys, all forms ---- long tons | (1) | 1 |
| Titanium ore and concentrate | 35 | 8 |
| Zinc: | | |
| Oxide and hydroxide | -- | (1) |
| Metal and alloys, all forms | (1) | 1 |
| Other: | | |
| Ores and concentrates | 54 | (1) |
| Metalloids, n.e.s | 2 | -- |
| Metals including alloys, all forms | (1) | -- |
| **NONMETALS** | | |
| Abrasives, natural | 4 | 23 |
| Cement, hydraulic | 133 | 8 |
| Chalk | -- | 1 |
| Clays and clay products | 12 | 39 |
| Feldspar, leucite, and nepheline | 1 | 1 |
| Fertilizer materials, natural and manufactured | 64 | 9 |
| Graphite, natural | 18,334 | 17,568 |
| Gypsum and plasters | (1) | (1) |
| Lime | 1 | (1) |
| Mica, all forms | 1,149 | 1,805 |
| Pigments, mineral, natural | (1) | -- |
| Precious and semiprecious stones (except diamond), including quartz crystal and synthetic stones ---- kilograms | 185,159 | 205,271 |
| Salt and brine | 2,295 | 2,189 |
| Stone, sand and gravel | 177 | 39 |
| Sulfuric acid | (1) | 1 |
| Talc, steatite, soapstone, and pyrophyllite | (1) | -- |
| Other nonmetals, n.e.s.: | | |
| Mineral substances, n.e.s | 4 | 2 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 6 | 4 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Coal and briquets | -- | 1 |
| Petroleum: | | |
| Crude and partly refined ---- thousand 42-gallon barrels | (1) | -- |
| Refinery products: | | |
| Gasoline ---- do | r 311 | 411 |
| Kerosine ---- do | r 106 | 180 |
| Distillate fuel oil ---- do | r 328 | 485 |
| Residual fuel oil ---- do | 1,187 | 1,268 |
| Lubricants ---- do | (1) | (1) |
| Other: | | |
| Liquefied petroleum gas ---- do | 80 | 88 |
| Bitumen and bituminous mixtures, n.e.s ---- do | (1) | (1) |
| Unspecified ---- do | r 145 | 88 |
| Total ---- do | r 2,157 | 2,520 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | -- | (1) |

r Revised.
1 Less than ½ unit.

## Table 6.—Malagasy Republic: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum: | | |
| Oxide and hydroxide | 161 | 5 |
| Metal including alloys, all forms | r 929 | 1,277 |
| Arsenic oxide and acid | 5 | -- |
| Chromium oxide and hydroxide | 1 | (1) |
| Cobalt oxide and hydroxide kilograms | 30 | 2 |
| Copper: | | |
| Ore and concentrate | -- | (1) |
| Metal including alloys, all forms | 69 | 56 |
| Gold metal, unworked, partly worked troy ounces | 23,181 | 44,079 |
| Iron and steel: | | |
| Scrap | 293 | -- |
| Pig iron, ferroalloys, similar materials | 6 | 15 |
| Steel, primary forms | 3 | -- |
| Semimanufactures | r 40,265 | 33,872 |
| Lead: | | |
| Oxide | 12 | 16 |
| Metal including alloys, all forms | 384 | 343 |
| Magnesium metal including alloys, all forms | (1) | -- |
| Manganese oxides | (1) | -- |
| Mercury 76-pound flasks | 2 | 4 |
| Nickel metal including alloys, all forms | (1) | (1) |
| Platinum-group metals including alloys, all forms troy ounces | 96 | -- |
| Rare-earth metals including alloys, all forms | 6 | 2 |
| Silver metal including alloys, all forms troy ounces | 7,395 | 4,180 |
| Tin: | | |
| Oxide long tons | (1) | (1) |
| Metal including alloys, all forms do | 18 | 8 |
| Titanium oxides | 15 | 3 |
| Zinc: | | |
| Oxide and hydroxide | 41 | 22 |
| Metal including alloys, all forms | 96 | 45 |
| Zirconium ore and concentrate kilograms | 180 | -- |
| Other: | | |
| Oxides and hydroxides | 4 | 8 |
| Metals and alloys, all forms: | | |
| Metalloids, n.e.s | 5 | 2 |
| Pyrophoric alloys | 4 | 8 |
| Base metals, n.e.s | 8 | 11 |
| **NONMETALS** | | |
| Abrasives: | | |
| Crude, natural | 10 | 10 |
| Dust and powder of precious and semiprecious stones kilograms | 85 | 7 |
| Grinding and polishing wheels and stones | 49 | 37 |
| Asbestos | 20 | 10 |
| Barite | 2 | 1 |
| Boron materials: | | |
| Crude natural borates | 41 | 48 |
| Oxide and acid | 7 | (1) |
| Cement, hydraulic | 61,632 | 43,496 |
| Chalk | 492 | 253 |
| Clays and clay products (including all refractory brick): | | |
| Crude clays, n.e.s | 46 | 127 |
| Products | 1,386 | 744 |
| Cryolite and chiolite, natural | 8 | -- |
| Diamond, all grades thousand carats | 35 | 35 |
| Diatomaceous earth | 40 | 5 |
| Fertilizer materials: | | |
| Crude and manufactured: | | |
| Nitrogenous | 516 | 3,782 |
| Phosphatic | 2,223 | 814 |
| Potassic | 3,931 | 3,177 |
| Other, including mixed | 2,887 | 7,835 |
| Ammonia | 39 | 29 |
| Graphite, natural | 1 | (1) |
| Gypsum and plasters | 4,174 | 3,069 |
| Lime | 1,601 | 2,202 |
| Magnesite | 25 | (1) |
| Mica, crude and worked | (1) | (1) |
| Pigments, mineral, including iron oxide | 91 | 98 |
| Precious and semiprecious stones, including synthetic, except diamond kilograms | 2,195 | 256 |
| Pyrite (gross weight) | -- | 20 |
| Quartz crystal kilograms | 167 | 1 |

See footnotes at end of table.

Table 6.—Malagasy Republic: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Salt and brine | | 863 | 628 |
| Sodium and potassium compounds | | 1,979 | 2,230 |
| Stone, sand and gravel: | | | |
| Dimension stone | | 2 | (1) |
| Gravel and crushed rock, n.e.s | | 4 | 6 |
| Quartz and quartzite | | 20 | (1) |
| Sand, excluding metal bearing | | 19 | 6 |
| Sulfur: | | | |
| Elemental, all forms | | 5 | 2 |
| Sulfur dioxide | | 3 | 1 |
| Sulfuric acid | | 113 | 138 |
| Talc, steatite, soapstone, pyrophyllite | | 54 | 1 |
| Other: | | | |
| Crude nonmetals, n.e.s | | 8,961 | 2,277 |
| Oxides and hydroxides of magnesium, strontium, and barium | | (1) | 55 |
| Bromine, iodine, fluorine | | 7 | 11 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | | (1) | (1) |
| Carbon black | | 3 | 1 |
| Coal, including briquets, all grades | | 21,418 | 12,352 |
| Coke and semicoke | | 64 | 125 |
| Hydrogen, helium, and rare gases | | 6 | 9 |
| Petroleum: | | | |
| Crude and partly refined | thousand 42-gallon barrels | r 4,787 | 4,852 |
| Refinery products: | | | |
| Gasoline | do | 62 | 58 |
| Kerosine and jet fuel | do | 7 | 3 |
| Distillate fuel oil | do | 113 | 13 |
| Residual fuel oil | do | 1 | -- |
| Lubricants | do | r 52 | 54 |
| Other: | | | |
| Liquefied petroleum gas | do | (1) | (1) |
| Mineral jelly and wax | do | 37 | 29 |
| Petroleum coke | do | 3 | -- |
| Bitumen, bituminous mixtures and other residues | do | 86 | 24 |
| Unspecified | do | (1) | (1) |
| Total | do | r 361 | 181 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | r 156 | 93 |

r Revised.
1 Less than ½ unit.

## COMMODITY REVIEW

**Metals.**—*Bauxite.*—The 165-million-ton Manantenia bauxite deposit continued to be the object of negotiations between the Malagasy Government and outside parties. Compagnie de Produits Chimiques et Péchiney continued its search for associates to aid in development of the project. A loan agreement was signed with Japan to construct a hydroelectric complex on the Namorona River to supply power to aluminum smelters.

*Chromite.*—Madagascar Chrome Resources Development Co., a new joint venture, began exploration for chrome. The new company is a partnership between seven Japanese ferroalloy producers and C. Itoh & Co., Ltd. (Japan), BRGM, and Compagnie Financiese Eurafricaine, a subsidiary of Anglo American Corp. of South Africa.[47] Approximately 360 outcrops have been located, the biggest running for 200 meters on strike with a vein width of 10 meters. A geological survey and diamond-drilling program is expected to take several years to complete. The survey will be centered on an 8,000-square-kilometer area in the Andilamena-Tsaratanana Districts. First shipments of chromite to Japan are expected in 1979.[48]

*Iron.*—Deposits discovered at Ambatovy, Bekiskopa, Fastentsara, and Ambohipaky were being evaluated.

*Nickel.*—Exploration and evaluation activities reported in the 1973 Minerals Yearbook continued. The deposit would be exploited with power from the proposed Rogez hydroelectric project.

**Nonmetals.**—*Cement.*—The Amoania cement plant was reportedly operating at full capacity. The construction of a second plant to satisfy local needs was under consideration. This plant will probably be located near Tananarive in the plateau region where most of the cement is used.

*Graphite.*—Demand for quality flake graphite continued to be considerably more than production. Exports continued to be limited primarily by internal transportation difficulties and the producers' reluctance to make necessary investments for improvement of facilities. Production in 1974 was 17,280 tons.

*Mica.*—Production decreased slightly to 857 tons in 1974. Mica production continues erratic because of strong competition from synthetic products.

**Mineral Fuels.**—*Coal.*—Utah Development Co. applied for a coal prospecting permit in the Tulear region, southern Malagasy. However, it is believed that little activity will result because of the investment necessary to develop the infrastructure required to develop the coal deposits.

*Petroleum.*—An oil exploration program continued in all the sedimentary basins of the island and the surrounding Continental Shelf. The presence of oil and gas in varying quantities has been indicated in several areas. Evaluation of these shows is continuing; however, no exploitable reserves of petroleum have yet been found.[49] The petroleum refinery at Tamatave continued to operate at close to its installed capacity of 31,500 barrels per day.

**Other Minerals.**—The entire east coast of the Malagasy Republic is covered by exploration permits for ilmenite and zircon sand. Montedison continued its study of commercially exploitable beach sand deposits in the Tamatave region. Evaluation of the beach sand deposits (ilmenite, monazite, and zircon) of the extreme southeast coastal region continued. BRGM and United States Steel Corp. are interested in developing these deposits.[50]

# MALAWI[51]

The mineral industry of Malawi was of minor significance to the nation's economy in 1974. Mineral production consisted primarily of cement, dolomite, agate, and small amounts of sand, and gravel for local use. Mineral exploration continued at a fairly high level, and much interest was being shown in Malawi's coal and carbonatites. Malawi recorded its third year of surplus in 1974 in its recurrent budget, and foreign exchange reserves climbed 25% to $83.2 million.[52] While an inflation rate

[47] Engineering and Mining Journal. V. 126, No. 3, March 1975, p. 17.
[48] Mining Journal. V. 284, No. 7274, Jan. 17, 1975, p. 45.
[49] Mining Annual Review—1975, pp. 432–433.
[50] World Mining. V. 28, No. 7, June 1975, pp. 139–140.
[51] Prepared by Janice L. W. Jolly.
[52] Where necessary, values have been converted from Malawi kwacha to U.S. dollars at the rate of 1 Malawi kwacha = US$1.20.

of nearly 18% allowed real GDP to increase by only 5% in 1974 compared with 8.5% in 1973, the 1974 GDP at current prices was estimated to be $641.6 million, up 24.7% from 1973.

The 1974–75 budget was presented on March 15, 1974, with development estimates providing for a total expenditure of $59.6 million. Over $16.8 million was allocated to roads and railways, and a similar amount to agriculture and natural resources. Development will continue to be financed largely from external loans and grants, but using local resources of over $10.8 million was also planned. Canada provided Malawi with $22.4 million to expand and improve the railway system, including a new line from Salima to Lilongwe. Railway construction started and was scheduled for completion by 1978. IDA granted a loan of $10 million for improvement of the Lilongwe-Kasungu road. AID made a $11.4 million loan for the construction of the Lilongwe-Mchinji-Zambian border road. This road will facilitate movement of traffic between Zambia and Malawi, which by 1975 would become very important in transportation of copper as other Zambian export routes became closed. There was a total of 10,730 kilometers of road in 1974 with approximately 2,045 kilometers paved or graveled.

About 5% of the development budget for 1974 was to be spent on electric power development. Phase 1 of the Tedzani Falls hydroelectric project on the Shire River became operational in mid-1973, and contracts for phase 2 were let in May 1974. Power production by the Electric Supply Commission increased 12%. A study was being made for a second stage for the Nkula Falls hydroelectric facility. The installed hydroelectric capacity was 64 megawatts in 1974, supplemented by a thermal capacity of 24 megawatts, for a total of 88 megawatts.

Development work on the new capital city forged ahead. Most government ministries, as well as some foreign missions, have now moved to the new capital. The final move is scheduled for 1976–77, but Lilongwe officially assumed the title of capital city on January 1, 1975.

Malawi's economy was described as a partnership between private and public sectors. Malawi continued to attract substantial foreign aid and investment and was encouraging further diversification of its industrial base. Establishment of foreign-owned industry in Malawi is particularly encouraged where Malawi parastatal participation is considered. Taxes on companies are essentially the same whether controlled by foreign or local interests. The basic corporate income tax rate is 40% of net profit, with an additional 5% on profits for companies not incorporated in Malawi or companies repatriating profits to countries with no corporate taxes. All Overseas Private Investment Corporation (OPIC) programs are potentially operative in Malawi. Export restrictions exist only as license requirements in areas of agricultural, cement, base-metal, petroleum, and gem stone products.

Exports were valued at an estimated $121.8 million in 1974, up 27% over those of 1973. Exports went mostly to the United Kingdom, Rhodesia, Zambia, the United States, the Republic of South Africa, the Netherlands, and Ireland. Exports to the European Economic Community (EEC) accounted for 56% in 1974, and Africa and North America accounted for 23% and 9%, respectively. Although reexports in 1974 were 16% higher than in 1973, petroleum products shipped from the Salima storage depot to Zambia were down 48%, reflecting changes in distribution patterns introduced in late 1973.

Imports were valued at an estimated $185.4 million in 1974, up approximately 34.7% from those of 1973, and came mostly from the United Kingdom, the Republic of South Africa, Rhodesia, Japan, Zambia, West Germany, and the United States. Fertilizer prices more than doubled, as did petroleum prices. In the first 6 months of 1974, 517,473 barrels of refined petroleum products were imported, mainly from Iran, the Republic of South Africa, and Mozambique. The value for oil imports increased from an estimated $17 million in 1973 to about $29 million in 1974. About 15% of Malawi's import value was estimated to be refined oil products.

Preliminary studies were underway for the establishment of a fertilizer granulating plant to be supplied from phosphate deposits located near Tundulu. Mineral exploration continued during 1974 with several mining companies holding exclusive licenses for certain areas. UNDP and the Malawi Geological Survey were also active. With the prospect of a growing coal market, there was a renewed interest in

the coal deposits located at Chiromo in the south and the Nkana coalfield in the Karonga District of northern Malawi. The Geological Survey conducted a brief reconnaissance of these deposits. The Nkana Field, an extension of a larger coalfield in Tanzania, has inferred reserves of about 12.7 million tons within 500 feet of the surface. Exploration around the carbonatites continued. Lonrho (Malawi) Ltd. was looking into commercial viability of the Kangakhunde Hill monazite-strontiante deposit. About 1,000 tons of ore was mined for pilot plant tests. Reynolds International was interested in fluorite-bearing carbonatites located in the southeast. International Nickel S.A. (Pty) and Eland Exploration (Pty) were also prospecting in southern and central Malawi. Pitting and sampling for assessment of the Chimwadzulu sapphire-ruby occurrence was done by Hermes Mining Ltd. The UNDP airborne geophysical survey in 1971 was being followed up by ground investigations by UNDP personnel and the Geological Survey. Four areas were included: Karonga and Rumphi in the north, Dzalanyama in the central region, and Nsanje in the south. Thorium and possible uranium mineralization was indicated by radiometric anomalies along several zones in the Karonga area.

The Portland Cement Co. (Malawi) Ltd. mined 123,418 tons of limestone in 1974 at its Changalume operation west of Zomba. About 81,073 tons of cement were produced along with about 91 tons of dolomite. About 21.8 tons of red and gray agates were also produced from the Chikwawa District. Unknown quantities of rock and gravel for road building were also quarried.

Persons employed in the mining and construction field in 1974 were listed as 23,733, up 8.4% from 1973.[53] Higher rates of pay for migrant workers, including mine workers in the Republic of South Africa, offset the effects of repatriation following suspension of mine worker recruitment early in 1974. This followed an airline crash on April 4, 1974, which resulted in the death of 17 Malawian mine workers returning from the Republic of South Africa. At one time in 1974, the number of mine workers at work in the gold mines was up to 130,000. By 1975, there were fewer than 12,000.

[53] Office of the President and Cabinet, Economic Planning Division, Zomba, Malawi. Economic Report 1975. Budget Document No. 4, p. 53.

**Table 7.—Malawi: Exports and reexports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| **METALS** | | | |
| Copper metal and alloys, all forms | | 85 | 53 |
| Iron and steel metal: | | | |
| Scrap | | 897 | 380 |
| Pig iron, ferroalloys, crude steel and semimanufactures | | r 116 | 221 |
| Lead metal and alloys, all forms | | 85 | 112 |
| **NONMETALS** | | | |
| Cement, hydraulic | | 29 | 14 |
| Precious and semiprecious stones, unspecified | kilograms | -- | 3,062 |
| Stone, sand and gravel | | -- | 19 |
| Other nonmetals, n.e.s | | r 4 | (1) |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Petroleum refinery products: | | | |
| Gasoline | 42-gallon barrels | 42,797 | 36,121 |
| Jet fuel | do | 195 | 879 |
| Distillate fuel oil | do | 44,801 | 46,540 |
| Lubricants | do | 2,665 | 3,304 |
| Other: | | | |
| Paraffin | do | 10,860 | 9,908 |
| Unspecified | value | $44,503 | $50,478 |

r Revised.
1 Less than ½ unit.

## Table 8.—Malawi: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum metal and alloys, all forms | 370 | 795 |
| Copper metal and alloys, all forms | 57 | 36 |
| Iron and steel: Scrap, pig iron, ferroalloys, crude steel and semimanufactures | r 23,403 | 25,925 |
| Lead metal and alloys, all forms | 26 | 10 |
| Nickel metal and alloys, all forms | (1) | -- |
| Tin metal and alloys, all forms long tons | 19 | 202 |
| Zinc metal and alloys, all forms | 44 | 5 |
| Other, precious metals, not further specified troy ounces | r 685 | 1,812 |
| **NONMETALS** | | |
| Abrasives, natural, grinding and polishing wheels and stones | 12 | 16 |
| Cement, hydraulic | 3,035 | 231 |
| Clay products: | | |
| Refractory | 838 | 416 |
| Nonrefractory | 636 | 1,161 |
| Fertilizer materials: | | |
| Crude, natural, phosphatic | 11 | -- |
| Manufactured: | | |
| Nitrogenous | 52,592 | 32,257 |
| Phosphatic | 118 | 795 |
| Potassic | 182 | 27 |
| Other | 4,140 | 13,381 |
| Lime | 2,865 | 2,686 |
| Pyrite | -- | 100 |
| Salt and brine | 13,819 | 13,616 |
| Sodium and potassium compounds, n.e.s | 1,305 | 2,098 |
| Stone, sand and gravel: | | |
| Dimension stone | r 23 | 120 |
| Other | 625 | 196 |
| Elemental | 136 | 49 |
| Sulfuric acid | 18 | 14 |
| Other nonmetals, n.e.s.: | | |
| Crude | 4,261 | 2,683 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals | 2,475 | 1,769 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Asphalt and bitumen, natural | 3,692 | 7,536 |
| Carbon black | 35 | 8 |
| Coal, coke, peat | 54,235 | 57,679 |
| Petroleum refinery products: | | |
| Gasoline thousand 42-gallon barrels | 327 | 335 |
| Jet fuel do | 68 | 69 |
| Kerosine do | r 117 | 120 |
| Distillate fuel oil do | 408 | 435 |
| Residual fuel oil do | 39 | 35 |
| Lubricants do | 22 | 27 |
| Other do | r 6 | 6 |
| Mineral tar and other coal–, petroleum–, or gas-derived crude chemicals | 144 | 170 |

r Revised.
1 Less than ½ unit.

## MALI [54]

The mineral industry of Mali represented a very small sector of the Nation's economy in 1974. Mineral production consisted primarily of cement, marble, gold, and salt. Mineral exploitation of other commodities remained in the research stage. Salt production, estimated at approximately 3,000 tons per year, is done by traditional methods, with no central authority for monitoring overall production. Cement production reportedly increased 16% during 1974 to 48,500 tons.[55] An estimated 30 troy ounces of gold was produced.

Mali's economy has been plagued by a number of serious problems in recent years, stemming principally from the drought that has gripped this part of Africa for 7 years. The drought ended in 1974, but this was accompanied by catastrophic flooding in parts of Mali during August and September 1974. Even so, with return to more normal weather conditions, agriculture, which contributed over 43% to the 1974 GDP of approximately $430 million,[56] was expected to regain some strength.

Heavy reliance on imports has contributed to a weakening of the Malian financial position. Increased prices during 1974 for oil and other imported items resulted in a negative trade difference of approximately $66.2 million between the value for imports ($102.4 million) and exports ($36.2 million). On the positive side, Mali's industrial sector has been steadily expanding, and mineral prospecting has revealed promising ore deposits. A number of development projects for Mali's natural resources were being planned or were underway.

Mali commenced the new 5-year Development Plan for 1974–78. A total of $823 million was to be spent over the planned period. About 78%, or $642 million, was to be derived from foreign aid. The amount allotted to mine development was $27.9 million, which was to include the following: (1) Bauxite deposits, estimated at 800 million tons of 40% to 45% $Al_2O_3$ and less than 4% $SiO_2$; (2) iron, estimated at 1 billion tons of 56% to 65% Fe; (3) manganese, estimated at 3.5 million tons of 43% to 46% Mn; (4) lithium, estimated at 300,000 tons of 6% to 7% lithium oxide; (5) phosphate, estimated at 20 million tons of 28% to 30% $P_2O_5$; and (6) limestone. Objects of prospecting would be deposits of kaolin, salt, copper, lead and zinc, uranium, gold, diamond, and oil. An expansion of the cement factory at Diamou and exploitation of the gold deposit at Kalana were planned as cooperative efforts with the U.S.S.R. A Japanese survey team indicated uranium reserves of about 91,000 tons of uranium oxide in the Adrar des Iforas area near the Algerian border. The Japanese Power Reactor and Nuclear Fuel Development Corp. was to continue prospecting for uranium in 1975.

Texaco and Exxon had a joint effort (50% each) in petroleum exploration. The permit, acquired by Texaco in 1970, covered 99,200 square miles in the Toudeni Basin. Extensive seismic operations were scheduled. In addition, Murphy Eastern Oil (the United Kingdom), Comoro Exploration Ltd., Sunningdale Oil Ltd .(Canada) and Sun-Global also conducted seismic surveys for petroleum in Mali. Energy Petroleum Co. of Delaware was exploring for oil in the Azaouak Valley near Nigeria in southeastern Mali.

Foreign aid for development projects during 1974 were multinational. In September 1974, French aid of $4 million was given for various public works, agriculture, and administration projects. The Aid and Cooperation Fund (FAC) agreed to grant $2.1 million for the Kayes road program (438 kilometers of road). In addition, financing was also given earlier in July 1974 by FAC for final studies on the Selinque dam. The Federal Republic of Germany also loaned $15.2 million to begin an oil refinery with an estimated capacity of 30,000 tons at Kita, construction of a highway between Tienfala and Koulikoro, and two other development projects. The People's Republic of China (PRC) was expected to aid with the Manatali Dam.[57] Mali was among 24 states that in August 1974 set up the Islamic Development Bank with an initial capital of $900 million. The purpose of the bank was to help the economic and social de-

[54] Prepared by Janice L. W. Jolly.

[55] U.S. Embassy, Bamako. State Department Airgram A–13, May 12, 1975, p. 4.

[56] Where necessary, values have been converted from Malian francs (MF) to U.S. dollars at the rate of MF469=US$1.00.

[57] Industries et Travaux D'Outremer (Paris). Mali. V. 22, No. 252, November 1974, p. 1003.

velopment of Islamic countries and communities.

In a meeting in May 1974, a master plan for the Senegal River Development Organization (OMVS) was adopted by the three participating countries (Mali, Senegal, and Mauritania) that would serve as a working document for foreign sources of financing. Ownership of the projects was agreed to belong to the three nations as well as financial guarantee and debt, and the principle of equal rights with case-by-case examination would be applied to water usage. The Manantali Dam, built on Malian territory, will thus belong to the OMVS nations. The development of the river basin includes both agriculture and mining. Investments totaling $3.3 billion to be spent over 40 years were visualized. They include establishment of electric power at Manantali and a mineral (bauxite and iron) transport plan from Mali and Senegal. In the first 7 years, the Manantali Dam ($110.8 million) the Delta Dam ($21.7 million), and the port development at Saint Louis ($27 million) the Kayes port, and ports of call along the length of the river would be completed. Two other dams (Gouina and Felou) will be completed by 1990. Development of the mining sector is linked to electrical power production. OMVS experts expect a production of 600,000 tons of alumina and 5 million tons of iron ore per year from deposits located southeast of Manantali. Actual mining depends upon completion of the necessary infrastructure.

Studies for the Selinque dam are being done under multinational cooperation between France, Italy, FRG, European Development Fund (FED), and UNDP. These studies have already cost $1.1 million, and France granted a new subsidy of about $234,500 in 1974. The dam, located 30 kilometers southeast of Bamako on the Sankarani River, will supply a four-turbine hydroelectric powerplant with an installed capacity of 44.8 megawatts. Financing to build the dam was expected from FRG, Saudi Arabia, France, Canada, Italy, FED, and the African Development Bank (ADB). Construction work on the dam was expected to begin during the last quarter of 1976.

Electricity was provided by the Société Energie du Mali (EDM), which is owned 55% by the State and 45% by private and public French interests. Electricity was produced by two hydroelectric centers and 10 diesel generators with a total installed capacity of 33,783 kilowatt-hours. Manantali will have a 150-megawatt capacity. Total electrical production in 1973 was 60.9 million kilowatt-hours, an increase of 16% over that of 1972.

Petroleum imports during the first half of 1975 were from Senegal and Ivory Coast. Refined products totaled 438,000 barrels during this period compared with 548,143 barrels during the second half of 1974.

**Table 9.—Mali: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | | 1971 |
|---|---|---|
| **METALS** | | |
| Aluminum metal including alloys, all forms | | (1) |
| Copper metal and alloys, all forms (including matte) | | 4 |
| Iron and steel metal: | | |
| Scrap | | 810 |
| Semimanufactures | | 2 |
| Tin metal including alloys, all forms | long tons | (1) |
| **NONMETALS** | | |
| Cement | | 21 |
| Salt | | 1,347 |
| Sodium and potassium compounds, n.e.s., sodium hydroxide | | 85 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Coal and briquets | | (1) |
| Petroleum refinery products: | | |
| Gasoline | 42-gallon barrels | 1,395 |
| Kerosine | do | 299 |
| Distillate fuel oil | do | 1,153 |
| Total | do | 2,847 |

[1] Less than ½ unit.

## Table 10.—Mali: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | | 1971 |
|---|---|---|
| **METALS** | | |
| Aluminum: | | |
| Bauxite and concentrates | | (1) |
| Metal including alloys: | | |
| Scrap | | 144 |
| Semimanufactures | | 146 |
| Arsenic trioxide, pentoxide and acids | | 5 |
| Cadmium metal including alloys, all forms | | (1) |
| Copper metal including alloys, semimanufactures | | 36 |
| Iron and steel metal: | | |
| Scrap | | 10 |
| Pig iron, ferroalloys, and similar materials | | 3 |
| Semimanufactures | | 10,023 |
| Lead: | | |
| Oxides | | 1 |
| Metal including alloys: | | |
| Scrap | | 7 |
| Semimanufactures | | 2 |
| Manganese oxides | | 2 |
| Platinum-group metals including alloys, all forms | troy ounces | 161 |
| Silver metal including alloys | do | 547 |
| Tin: | | |
| Ore and concentrates | long tons | 1 |
| Metal including alloys, all forms | do | 1 |
| Zinc oxides | | 2 |
| Other: | | |
| Ore and concentrate | | 1 |
| Metals including alloys, all forms: | | |
| Metalloids | | 4 |
| Waste and sweepings of precious metals | kilograms | 1 |
| **NONMETALS** | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | | 7 |
| Grinding and polishing wheels and stones | | 2 |
| Clays and clay products (including all refractory brick): | | |
| Crude clays, n.e.s | | (1) |
| Products: | | |
| Refractory (including nonclay bricks) | | 282 |
| Nonrefractory | | 137 |
| Fertilizer materials: | | |
| Crude: | | |
| Nitrogenous | | 1,952 |
| Phosphatic | | 2,943 |
| Potassic | | 90 |
| Other | | 34 |
| Ammonia | | 1 |
| Gypsum and plasters | | 1,008 |
| Lime | | 146 |
| Pigments, mineral: | | |
| Natural, crude | | 6 |
| Iron oxides, processed | | 1 |
| Salt | | 16,826 |
| Sodium and potassium compounds, n.e.s | | 1,362 |
| Sulfur: | | |
| Elemental, all forms | | 58 |
| Sulfuric acid and oleum | | 54 |
| Talc, steatite, soapstone, pyrophyllite | | 21 |
| **MINERAL FUELS AND RELATED MATERIALS** | | |
| Coke and semicoke | | 18 |
| Petroleum refinery products: | | |
| Gasoline | thousand 42-gallon barrels | 266 |
| Kerosine | do | 74 |
| Distillate fuel oil | do | 133 |
| Residual fuel oil | do | 110 |
| Lubricating oil and grease | do | |
| Other: | | 16 |
| Liquefied petroleum gas | do | 3 |
| Bitumen and other residues, and bituminous mixtures, n.e.s | do | 484 |
| Unspecified | do | (1) |
| Total | do | 1,086 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | 276 |

[1] Less than ½ unit.

## MAURITANIA [58]

The mineral industry of the Islami Republic of Mauritania increased its contribution to the country's economy to about 45% of the GDP in 1974. Value of mineral output was estimated at $173 million [59] compared with $121.4 million in 1973. Copper production decreased 6%, but iron increased 11% and gypsum increased over 500% from the 1973 production figures. Small amounts of byproduct gold and salt were also produced. The iron mines were nationalized on November 28, 1974, and the copper mines were being considered for nationalization in early 1975. The Government was moving ahead with studies aimed at construction of a copper smelter at Nouakchott, a steel mill at Nouadhibou, and the million-ton petroleum refinery at Nouadhibou, Mauritania's iron ore port. Inflation was a problem through much of 1974, aggravated by the rise in oil prices and other import costs. To ease the burden of higher prices, the Government subsidized staple foods and transportation costs. Such subsidies cost the Government an estimated $7.2 million in 1974. More than one-half of Mauritania's yearly fuel consumption has consisted of gas and oil. Mauritania has few automobiles and little need for heating oil, but its huge iron-mining complex is run almost entirely on petroleum products. A total of 159,251 tons of petroleum products was used in 1974, down 2% from the 1973 total. All electrical equipment utilizes diesel turbines.

Mauritania is a member of the West African Economic Community (CEAO), which is a regional economic cooperation organization composed of the Ivory Coast, Upper Volta, Mali, Niger, and Senegal. It was instituted in 1959 and revised in 1966. Mauritania also joined the Arab Center for Industrial Development, which is an organ of the Arab league, in 1973. The center was created in 1969 to coordinate the efforts of Arab countries in various industrial fields. Mauritania was expected to join the Association of Iron Ore Exporting Countries in 1975. A general agreement between Bulgaria and Mauritania was signed June 29, 1974, for cooperation in mining and geology, agriculture, and commerce. Bulgaria agreed to send several teams of specialists to Mauritania to explore these areas of cooperation. Romania was also expected to cooperate on mineral activity. Credits for highway and port improvement in 1974 totaled $11 million from the Canadian Fund for International Development Agency (CIDA), the Kuwait Fund for Arab Economic Development, and the World Bank.

Exploration efforts for various minerals were continued by the UNDP, the Société National Industrielle et Minière (SNIM), BRGM and several private consortiums. The Kuwait Fund agreed to finance a study to synthesize past geological reports and to develop a minerals master plan for Mauritania. This study was to begin in 1975 and may be done by a United States firm. UNDP exploration found signs of manganese on the eastern part of the Requeibat Ridge.

BRGM continued its studies at Diaguili where substantial new copper deposits (with gold) have reportedly been found near Selibaby on the Senegal-Mali frontier. A geological study [60] was also published on the central part of the Mauritanides belt, providing some description of the copper concentrations of the area. A permit for copper prospecting was accorded to SNIM in the Akjoujt region. The Société Minière de Mauritanie (SOMIMA) has been plagued with concentration-process problems since production started in 1971. Losses were estimated at about $35 million and were absorbed by the parent Charter Consolidated Company. During 1974, copper ore production reached 32,900 tons of concentrates, containing 20,079 tons of metal. These are oxide ores with 2.5% to 2.9% copper and 3 grams per ton of gold. With proven deposits of copper oxides expected to be exhausted by 1978, SOMIMA was considering exploitation of the copper sulfides with reserves estimated at 35.9 million tons of 1.28% copper and 0.8 gram per ton of gold.[61] No final decision on the copper sulfide project was expected until early 1975. The Société Nationale Industrielle and Kuwaiti interests formed a joint company to build a 30,000-ton-per-year copper smelter.

[58] Prepared by Janice L. W. Jolly.

[59] Where necessary, values have been converted from Mauritanian ouguiya (UM) to U.S. dollars at the rate of UM45 = US$1.00.

[60] Chiron, J. C. Geologic Study of the Mauritanide Belt Between the Line at Moudjeria and the River Senegal. Mem. BRGM, 1974, No. 84, 281 pp.

[61] SNIM Activities (Nouakchott). Bulletin de la Société Nationale Industrielle et Minière, 1975, p. 17.

The study of low-grade magnetite deposits east of Zouerate entered its final phase. Tests on the iron ore continued overseas and at the pilot plant at Zouerate. SNIM was granted permission to begin iron ore exploration in the Akjoujt region. The three iron mine areas (Tazadit, Rouessa, and F'Derick) produced 11.7 million tons of 63% iron ore in 1974. Iron ore exports went mainly to the United Kingdom, France, Japan, Belgium, Italy, and West Germany, with smaller shipments to Spain, Algeria, the Netherlands, United States, Yugoslavia, and Switzerland. Iron exports, valued at $130.3 million in 1974, accounted for about 70% of Mauritania's foreign exchange earnings and over 40% of the Government's revenues.

At current production rates, Mauritania's high-grade iron ore was expected to last only about another 10 years. The iron mining corporation, Société Anonyme des Mines de Fer de Mauritanie (MIFERMA) had been experimenting with a new dry concentration process for concentrating the 2 billion tons of low-grade ore (28% to 35%) interspersed with the currently exploited higher grade deposits. The pilot plant began operating in 1974. It was estimated that about $300 million would be needed for the large-scale, low-grade-ore exploitation. Before nationalization in 1974, the capital of MIFERMA was reportedly held by Mauritania (5%), BRGM (24%), Usinor and Denain Nordest Longwy (13%), other French industrial and banking groups (18%), Finsider of Italy (18%), August Thyssen Hütte AG (5%), and the U.S. firm International Minerals and Chemical Corp. (3%). The World Bank and the Caisse Centrale de Cooperation Economique (CCE) also held interests in the company. The new mining corporation will be run by SNIM. A joint venture was organized to prospect for iron ore in Sfariat-Zerrmar area by MIFERMA, SOMIMA, Basic Resources Inc., and some Dutch interests.

The gypsum quarry operated by SNIM began operations in October 1973. The quarry is located 65 kilometers north of Nouakchott at the N'Drahamcha sabkha. Production reached 8,312 tons in 1974 compared with 1,955 tons in 1973. Gypsum was being exported to Senegal and the West African Cement Co. plant in Rufisque.

A consortium of companies, including SNIM, BRGM, the Société Senegalaise des Phosphates des Thies, and the Romanian company, GEOMINES, began exploration for phosphate in the Aleg-Kaedi-Boghe region. An agricultural fertilizer plant was reportedly planned.

The Compagnie Française de Petroles (CFP) continued its exploration of Dorsale Regueibat and Tasiast for uranium. The company was given authority to widen its area of exploration and also add the following partners: In permit No. 22, PUK (20%), Commissariat à l'Énergie Atomique (10%), and TOTAL, Compagnie Minière et Nucleaire (70%); and in permit No. 26, Tokyo Uranium Development Co., Ltd. (20%), Compagnie Péchiney U.K. (20%), TOTAL (50%), and CFP (10%). Tokyo Uranium Development Co. is composed of Marubeni Corporation (57.5%), Nippon Mining Co., Ltd. (30%), Fiji Bank, and Industrial Bank of Japan (each 5%), and Yasuda Fire & Marine Insurance Co., Ltd (2.5%). Prospecting will begin in the Ghallaman area in northern Mauritania. The concession covers 165,000 square kilometers. The yearly investment is expected to be $500,000. The companies are required by contract to put up 20% of the funds required, enabling them to receive the same percentage of uranium ore. An aerial exploration program was completed in 1974.

In 1974, electricity was controlled by the Société Maurtanienne d'eau et d'Electricite (MAURELEC) which was owned 78.2% by the State and by the French CCE. Complete nationalization of the company was expected in 1975. In 1973, a total of 70 million kilowatt-hours of electricity was produced. New projects were expected to increase production as follows: At Nouakchott for 1974–75, a total of 27,000 kilowatts resulting from aid by the People's Republic of China; at Nouadhibou, 24,000 kilowatts by 1976; at Kaedi, 1,000 kilowatts; at Rosso, 600 kilowatts in 1974; and at Atar, 400 kilowatts in 1974. By 1976, the total installed power was expected to be 59.8 megawatts.[62]

Three test holes for petroleum were drilled in 1974. The first hole was by Texaco and Exxon in the Taoudenit Basin, 160 kilometers northeast of Tichit. Texaco ceded 50% of its petroleum rights to

[62] Industries et Travaux D'Outremer (Paris). Maritanie. V. 22, No. 253, December 1974, p. 1096.

Exxon in April 1974. It hit traces of gas. The second well was also located in the Taoudenit Basin some 400 kilometers northeast of Tichet and was sunk by AGIP Exploration and Exploitation (Mauritania) and the Japanese company World Energy Development Co. AGIP ceded 25% of its petroleum rights to World Energy in January 1974. World Energy Development is an affiliate of C. Itoh & Co. The agreement required approval of all three governments involved in the prospecting area. Shell Mauritania Co. hit gas at 3,500 meters in a well located 80 kilometers northwest of Nouakchott, offshore in about 600 meters of water. Amoco and Planet Oil and Mineral Corp. of Texas were prospecting off Cape Timeris. A refinery at Nouadhibou was to be financed by Austria (50%), the Netherlands (25%), and East Germany (25%). Crude oil for the refinery will be obtained from Algeria.

**Table 11.—Mauritania: Exports of mineral commodities**

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Copper ore and concentrate, gross weight ---------- metric tons | r 16,772 | 27,706 | Spain 7,104; Belgium-Luxembourg 6,624; France 6,224. |
| Iron and steel, ore and concentrate except roasted pyrite thousand metric tons | r 8,618 | 10,325 | United Kingdom 2,336; France 1,814; Japan 1,581. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Petroleum refinery products, residual oil thousand 42-gallon barrels | 201 | 107 | NA. |

r Revised. NA Not available.

**Table 12.—Mauritania: Imports of mineral commodities**
(Metric tons)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum metal including alloys, all forms | 93 | 28 |
| Copper metal including alloys, all forms | 40 | 19 |
| Iron and steel metal, all forms | 28,301 | 8,750 |
| Other metals including alloys, all forms | 144 | 182 |
| NONMETALS | | |
| Cement, hydraulic | 29,427 | 28,585 |
| Fertilizer materials, all forms | 1,505 | 381 |
| Other nonmetals, n.e.s., building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 461 | 468 |

## MAURITIUS [63]

Mineral activity in Mauritius consisted of marine salt and lime production in 1974 and a continuation of oil exploration in offshore areas. Mineral production contributed 0.1% to the estimated GDP of $468 million for 1974.[64] Approximately 5,000 tons of salt valued at $248,344 and 4,000 tons of lime valued at $223,538 were produced in 1974, representing nearly a 30% decrease in both quantity and value from the 1972 and 1973 production. Although the value of mineral production was down, the 1974 GDP for the nation of about 881,000 people saw a 71% increase at current prices over the 1973 GDP. This was mainly the result of the increase in sugar production and prices, and inflation, which was 29.1% in 1974 compared with 13.5% in 1973 and 5.4% in 1972. The value of exports ($296 million) exceeded the import value ($291 million) for a trade surplus in 1974, even though imports increased 92% in value over those in 1973. Included in imported goods were refined petroleum products from Iran and South Yemen. A total of 1.3 million barrels, comprised of motor gasoline (12.3%), jet fuel and kerosine (20.5%), distillate fuel oil (39.7%), and residual fuel oil (27.5%), was imported in 1974.

Prospecting for oil continued on the Texaco concession in the area of St. Brandon in the Cargados Carajos Shoals, 418 kilometers north of Mauritius. In early 1974, the Texaco project entered its second phase as it began geophysical probes with the ship *Western Endeavour* and was preparing to start the first test drillings. A drillship was to arrive in early 1975 to begin drilling. There were reports of oil and gas being found [65] as well as the discovery of large deposits of manganese nodules in the sea floor south of the Nazereth banks.[66] A team of Indian Government geologists were reportedly to begin studying other offshore oil prospects in 1975 as part of a technical assistance agreement. India was already assisting with a cement plant designed for internal needs. The People's Republic of China was assisting in building a new international airport to replace Plaisance airport, already saturated with heavy traffic.

## NIGER [67]

The mineral industry of Niger continued to play an increasingly important part in the national economy in 1974 because the principal economic activity, agriculture (peanuts, grains, and cattle), continued to suffer from the effects of drought. The mineral industry was the main employer of industrial labor, and minerals, largely uranium, were the most valuable export commodity. A change in government in April did not appreciably affect ongoing exploration, and the search for exploitable uranium and petroleum deposits accelerated in 1974. New uranium-exploration companies were formed, and the first drilling for petroleum began.

The Government created a new agency, the Bureau de Recherche et Exploitation Minière (BUREMI), to administer the country's mining research and development. BUREMI will have jurisdiction over all geological research and mining activities, including the granting of exploration permits, equity participation in mining ventures, marketing of mineral products, and the training of local technical cadres.

The value of mineral production, for which complete data are not available, increased in 1974 owing to higher world prices for tin and uranium. Uranium output, valued at an estimated $28.1 million,[68] accounted for most of Niger's mineral production value in 1974. Other mineral commodities produced were cement, tin concentrate, gypsum, limestone, salt, minor quantities of gold, and various amounts of crude construction materials, such as stone, sand and gravel, and clay. The only mineral exports were uranium and tin concentrate and probably small amounts of cement and salt. Exports of uranium oxide ($U_3O_8$), all to France, accounted for the bulk of total export sales.

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[63] Prepared by Janice L. W. Jolly.

[64] Where necessary, values have been converted from Mauritian rupees (Mau Rs) at the rate of MauRs6.04=US$1.00.

[65] L'Express (Port Louis). Oil and Natural Gas in Nazareth and Saint Brandon. July 6, 1974, p. 1.

[66] L'Express (Port Louis). What Are the Prime Minister and Mancham Doing in Paris? They Are Playing the Indian Ocean Power Game. Aug. 2, 1974, pp. 1, 8.

[67] Prepared by James H. Jolly.

[68] Where necessary, values have been converted from Communauté Financière Africaine Francs (CFAF) to U.S. dollars at a rate of CFAF202=US$1.00.

Principal mineral imports were iron and steel semimanufactures and refined petroleum products.

Société des Mines de l'Air (SOMAIR), a consortium composed of the Government of Niger, the French Commissariat à l'Énergie Atomique (CEA), Compagnie Française des Minerais d'Uranium, Péchiney-Mokta Mining Co. (France), Urangesellschaft AG (West Germany), and Agip Nucleare S.p.A. (Italy), was the sole producer of uranium in 1974. Production of $U_3O_8$ in concentrate at SOMAIR's Arlit uranium mine in northwest Niger, increased from 1,118 tons in 1973 to 1,318 tons in 1974. A second processing line at the SOMAIR plant was put into operation in December, but the new line was not expected to operate at full capacity during 1975. In 1976, production of uranium was scheduled to be between 1,500 and 2,000 tons, part of which was expected to be recovered from the leaching of dump materials.

Japan's Overseas Uranium Resources Development Co., joined with the CEA and the Government of Niger in Compagnie Minière d'Akouta (COMINAK) to exploit the uranium resources in the Akouta area southwest of Arlit. The mining venture, which will cost about $70 million, was expected to begin production in 1979 at a yearly rate of 2,000 tons $U_3O_8$.[69] Uranium reserves in the Akouta deposit were estimated at 30,000 tons $U_3O_8$. Japan planned to purchase about 40% of the uranium after enrichment in Europe.

The Government planned to develop a coal deposit, discovered near Agadez in 1964, to fuel a thermal power station for electricity at the Akouta uranium mining operation. Agadez coal reserves were estimated at about 4.5 million tons. The proposed power station was to be of sufficient size to eventually supply electrical power also to SOMAIR's Arlit mining operation.

Two uranium exploration ventures became active in 1974. In April, CONOCO, CEA, and the Government began a 3-year, $7 million exploration program on a CEA concession near Imouranen, 50 kilometers south of Arlit. As an equal partner, the Government was to have the right to market its share of the uranium produced.[70]

Société des Mines du Djado (SMD), a consortium composed of CEA, the Government, and Urangesellschaft AG of West Germany, began exploration for uranium in the Djado region of northern Niger. In August, Japan's Power Reactor and Nuclear Fuel Development Corp. took a 25% interest in SMD. The first phase of the venture, an exploration program covering 40,000 square miles was expected to cost about $13.3 million.

Société Minière du Niger produced 120 tons of tin concentrate, containing about 78 tons of tin at the Taroudji and El Meki mines in the southern Air Mountains. In 1974, all of the tin concentrate, valued at about $625,000, was exported to Nigeria for processing.

A small goal production resulted from panning of alluvial deposits in the Sirba River region. Niger's one cement plan, at Malbaza, operated at about 50% of capacity during 1974, producing about 20,500 tons of cement, which was 38% less than in 1973. Traditional production of salt by solar evaporation was sufficient for domestic needs.

Exploration drilling for petroleum began late in the year at two sites in northeastern Niger. Texaco Niger, Inc., and Exxon began drilling near Fauchi in the Agaden concession in November. Another drilling operation was started in December by Texaco, Exxon, and Global Energy Co. (a subsidiary of Rosario Resources Corp.) in the Sequidine concession area, which lies north of Abaden concession. Scheduled drilling depths were 3,000 meters at Fauchi and 2,500 meters at Sequidine.

Drilling was expected in three additional areas in 1975. CONOCO, which holds a concession in eastern Niger with Shell, planned to bring in a drilling rig from Chad to drill a well 40 kilometers northwest of N'Guigmi in the Lake Chad region in 1975. Niger Sun Oil Co. was expected to start drilling north of Quallam, in southwestern Niger early in 1975. Global was considering drilling in its Dosso concession north of Niamey. Aeromagnetic and geophysical exploration programs were continuing in most concession areas.

[69] Mining Journal. Start for Akouta Mining. V. 282, No. 7228, Mar. 1, 1974, p. 158.
[70] U.S. Embassy, Niamey, Niger. State Department Telegram 995, Apr. 9, 1974, 1 p.

## RWANDA [71]

The mining industry, Rwanda's consistent second source of export earnings, accounted for 17% of the total exports in 1974 compared with 22% in 1973. Cassiterite, the principal mineral produced and exported, furnished 12% of the total value of exports, a 4% decrease from that in 1973.

In discussions held with Swiss delegations, a new agreement was reached whereby Swiss experts will concentrate in mineral research in Rwanda. The previous agreement expired on February 4.

An aerial photography minerals prospecting project under the auspices of the United Nations was also inaugurated. It was hoped that it would be possible to locate geological structures containing exploitable mineral deposits.

## SENEGAL [72]

The only significant mineral currently being exploited in the Republic of Senegal is phosphate rock. Minor quantities of cement, salt, attapulgite (fuller's earth), and building stone were produced. The Government decided during 1974 that it would increase its ownership in the country's two phosphate-producing companies to 50%, effective January 1, 1975. Further, the Senegalese Government negotiated with the partners in the companies to accept a fixed lump-sum payment that would be created by the increase in the international price of phosphate rock. The distribution of the ownership of the companies has not been published; however, ownership is presumed to remain proportional to prior shares.

Compagnie Sénégalaise des Phosphates de Taiba ownership was 27.28% by BRGM, 23.87% by International Minerals and Chemical Corp. (IMC), 14.3% by Compagnie Financière pour l'Outer-Mer (Cofimer) of France, 10.41% by Cie. Central de Co-operation Economique (CCCE), 2.48% by Comiphos, 5.21% by Rhône-Progil, 3.76% by Auxom, 0.46% by OPFIA, and 3.05% by the Senegalese Government.[73]

The unusually high-grade calcium phosphate concentrate from Taiba commanded a market price of $76 per ton effective July 1, 1974. The plant and mine are located near Tivaouiane, 70 miles east of Dakar. Bucket-wheel excavators remove an average 25 meters of sandy overburden assisted by draglines. Draglines (18-cubic-yard capacity) are used to mine the 7-meter-thick matrix seam and load out into 100-ton trucks for transport to a grizzly screen and scrubbing station to remove coarse rubble. The slurry from this station is pumped to the washing and flotation plant. Taiba produced 1,472,000 tons of marketable phosphate rock in 1974, which is projected to increase to 1.6 million and 1.7 million tons in 1975 and 1976, respectively. Although the remaining reserve at the Taiba mine is limited to 25 million tons, the Tobene deposits adjacent to the Taiba mine are believed to have reserves ranging from 50 million to 100 million tons. Production from Tobene may start in 1978. Taiba ore assays 29% $P_2O_5$ in place and is concentrated to 37.3% $P_2O_5$. Overall weight recovery is 40%. Sales volume in 1974 totaled 1,574,000 tons. The principal markets were France, the Netherlands, the United Kingdom, and Greece.

The Société Sénégalaise des Phosphate de Thiès was owned wholly by the French firm Péchiney Saint-Gobain. The company operates an aluminum phosphate mine at Pallo, about 6 kilometers from Lam–Lam, where the plant is located. The Senegalese Government acquired a 50% interest in this company and also received a special contribution from the firm to permit the Government to share in the excess profits developed from the higher prices in effect in 1974. In addition to the aluminum phosphate mined at Pallo, a deposit of calcium phosphate at Lam-Lam, similar to the ore at Taiba, was mined in 1974. This deposit was mined in 1942 but mining was discontinued because of high costs. At the Pallo mine, the overburden ranges from zero to 5 meters and the thickness of the matrix ranges from 1 to 8 meters. The average ore assay in the ground is 28.5% $P_2O_5$. After the fines are screened out of the ore at Lam–Lam, the $P_2O_5$ content is 29.5%, and after calcining, 34%. The

[71] Prepared by Gertrude N. Greenspoon, mineral specialist, Division of Nonferrous Metals.
[72] Prepared by William F. Stowasser, physical scientist, Division of Nonmetallic Minerals.
[73] Industrial Minerals. No. 82, July 1974, pp. 35–36.

most recent estimate of reserves remaining at Pallo is 50 million tons.

Because the Pallo ore varies in thickness, drill holes for core samples are set on 25-meter centers. After the overburden is dozed to the side, the matrix is drilled, blasted, loaded into trucks, hauled to a crushing and transfer station, and trucked to Lam-Lam. The ore is screened at Lam-Lam to produce natural aluminum phosphate rock. Some of this material is calcined in a rotary kiln to solubilize the $P_2O_5$ content, and sold as clinker or Phospal and Polyfos. A small quantity of calcium phosphate was mined at Lam-Lam. The overburden is about 21 meters thick and the matrix averages 5 meters thick. The ore assays 28% to 30% $P_2O_5$ in place and can be screened to produce a 34% $P_2O_5$ product. Reserves are on the order of 800,000 tons. Production is not expected to exceed 100,000 tons per year and will not continue unless the international market price of phosphate rock remains at 1974 levels. The production of aluminum phosphate rock and special products is shown in the following tabulation:

| | 1973 | 1974 | Percent change |
|---|---|---|---|
| Natural aluminum phosphate rock | 218,895 | 405,862 | +85 |
| Special products: | | | |
| Clinker phosphates | 63,816 | 96,798 | +52 |
| Phospal and Polyfos | 5,407 | 4,615 | −15 |
| Baylifos | 78 | -- | -- |
| Crushed aluminum phosphate | 543 | 1,606 | +196 |
| Phosphate rock (calcium phosphate) | -- | 9,594 | -- |

The total production of phosphate rock in Senegal in 1974 was 1,472,000 tons from Taiba and 405,862 tons from Thies, or 1,878,000 tons. The calcium phosphate production from the Lam-Lam calcium phosphate mine, 9,594 tons, was probably included in the total production from the Société Sénégalaise des Phosphate de Thiès.

Cement production from the three-kiln plant at Rufisque, owned and operated by Société Ouest Africaine des Ciments (SOCOCIM), totaled 332,000 tons in 1974, a small increase over the 295,834 tons produced in 1973. Most of the 1974 production was used in Senegal, and 92,217 tons was exported to neighboring countries.

Salt production from the Sine-Saloum Saltflats was 150,000 tons, of which 105,817 tons was exported.

The Société Prochimat produced 4,810 cubic meters of attapulgite and exported 4,970 cubic meters.

A new refinery and petrochemical plant is planned for Cayar, about 60 kilometers north of Dakar, that will be able to accommodate supertankers after construction of a wharf.[74] The joint Sénégalese-Iranian project with participation from Gabon will have a capacity of 6 million tons per year of crude, one-half of which will be for bunkering, and the other one-half will be distilled products for export to the United States. This will be completed by 1978 and include a 250,000-ton-per-year sulfuric acid plant and an 80,000-ton-per-year phosphoric acid plant. The second stage of development, due onstream in 1980, will include a 100,000-ton-per-year ethylene unit, a 40,000-ton-per-year sodium unit, a 35,000-ton-per-year chlorine unit, a 90,000-ton-per-year ammonia plant, and a 50,000-ton-per-year polyvinyl chloride plant.

In the third stage, due to come onstream in 1983, the complex would receive a 420,000-ton-per-year fertilizer unit and a 45,000-ton-per-year detergent plant.

[74] Petroleum Times. November 15, 1974, p. 13.

## Table 13.—Senegal: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum metal including alloys, all forms | | r 5 | 12 |
| Copper metal including alloys, all forms | | 657 | 665 |
| Iron and steel: | | | |
| Scrap | | 9,192 | 11,917 |
| Ferroalloys | | 1 | (1) |
| Semimanufactures | | r 665 | 604 |
| Lead metal including alloys, all forms | | 211 | 189 |
| Nickel metal including alloys, all forms | | 156 | -- |
| Silver metal including alloys | troy ounces | 35 | 23 |
| Zinc metal including alloys, all forms | | -- | 7 |
| **NONMETALS** | | | |
| Cement | | 98,937 | 64,338 |
| Chalk | | (1) | 3 |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Bentonite | | 2,896 | 2,079 |
| Other | | 3 | 38 |
| Products: | | | |
| Refractory (including nonclay brick) | | 20 | -- |
| Nonrefractory | | 21 | 96 |
| Diatomite and other infusorial earth | | 1 | (1) |
| Fertilizer materials: | | | |
| Crude, phosphatic | thousand tons | 1,426 | 1,416 |
| Manufactured: | | | |
| Nitrogenous | | 240 | 51 |
| Phosphatic | | 67,195 | 77,715 |
| Potassic | | 7 | 331 |
| Mixed | | 6,194 | 7,221 |
| Ammonia | | 2 | 5 |
| Gypsum and plasters | | 1 | 2,006 |
| Lime | | 53 | 14 |
| Pigments, mineral, including processed iron oxides | | 1 | 2 |
| Salt | | r 129,637 | 100,064 |
| Sodium and potassium compounds, n.e.s | | 16 | 53 |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | | 16 | 580 |
| Worked, slate | | 2 | -- |
| Gravel and crushed rock | | 334 | 1,374 |
| Sand, excluding metal bearing | | 1 | 3 |
| Sulfur: | | | |
| Elemental, all forms | | 2 | -- |
| Sulfuric acid | | 22 | 94 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Asphalt and bitumen, natural | | 10 | -- |
| Coal | | -- | 10 |
| Petroleum refinery products: | | | |
| Gasoline | thousand 42-gallon barrels | r 151 | 176 |
| Kerosine | do | r 356 | 677 |
| Distillate fuel oil | do | 685 | 582 |
| Residual fuel oil | do | 384 | 417 |
| Lubricants | do | r 33 | 30 |
| Other: | | | |
| Liquefied petroleum gas | do | 17 | 13 |
| Unspecified | do | (1) | 2 |
| Total | do | r 1,626 | 1,897 |
| Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals | | 21 | 1 |

r Revised.
1 Less than ½ unit.

## Table 14.—Senegal: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum: | | |
| Oxide and hydroxide | 1 | -- |
| Metal including alloys, all forms | 545 | 541 |
| Antimony metal including alloys, all forms | 2 | 1 |
| Copper: | | |
| Matte | 4 | 2 |
| Metal including alloys, all forms | 60 | 59 |
| Gold metal, unworked or partly worked ---- troy ounces | 1,546 | 584 |
| Iron and steel: | | |
| Ore and concentrate ---- kilograms | 8 | 147 |
| Metal: | | |
| Scrap | 40 | 272 |
| Pig iron, ferroalloys, primary steel forms | r 5 | 7 |
| Semimanufactures | r 43,268 | 41,674 |
| Lead: | | |
| Oxides | 52 | 36 |
| Metal including alloys, all forms | 29 | 20 |
| Manganese oxides | 161 | 1 |
| Nickel metal including alloys, all forms | r 3 | 5 |
| Platinum-group metals including alloys ---- troy ounces | 32 | (1) |
| Silver metal including alloys ---- thousand troy ounces | 350 | 106 |
| Tin metal including alloys, all forms ---- long tons | 12 | 24 |
| Titanium oxides | 137 | 132 |
| Zinc: | | |
| Oxide | 58 | 40 |
| Metal including alloys, all forms | r 6 | 25 |
| Other: | | |
| Oxides, hydroxides, peroxides of metals, n.e.s | 13 | 35 |
| Metals, metalloids | r 8 | 7 |
| **NONMETALS** | | |
| Abrasives, natural, n.e.s.: | 5 | 4 |
| Pumice, emery, natural corundum, etc | 19 | 19 |
| Grinding and polishing wheels and stones | 960 | 1,262 |
| Asbestos | 351 | 32 |
| Barite and witherite | | |
| Boron materials: | 180 | 315 |
| Crude natural borates | 1 | 3 |
| Oxide and acid | 39,506 | 22,814 |
| Cement | 2,199 | 1,512 |
| Chalk | | |
| Clays and clay products including all refractory brick: | | |
| Crude clays, n.e.s.: | 3,402 | 1,459 |
| Bentonite | 89 | 65 |
| Kaolin | 252 | 168 |
| Other | | |
| Products: | r 616 | 957 |
| Refractory including nonclay brick | 1,998 | 1,091 |
| Nonrefractory | 94 | 32 |
| Diatomite and other infusorial earth | | |
| Fertilizer materials: | (1) | 3 |
| Crude, phosphatic | | |
| Manufactured: | 3,581 | 4,864 |
| Nitrogenous | 125 | 660 |
| Phosphatic | 10,667 | 10,492 |
| Potassic | (1) | 2 |
| Other, including mixed | 11,807 | 11,620 |
| Ammonia | 8 | 7 |
| Graphite, natural | | |
| Gypsum and plasters: | 10,833 | 8,528 |
| Gypsum | 497 | 529 |
| Plasters | r 16 | 2 |
| Mica, all forms | | |
| Pigments, mineral: | 62 | 98 |
| Natural, crude | 102 | 59 |
| Iron oxides, processed | | |
| Precious and semiprecious stones, except diamond: | 16 | 12 |
| Natural ---- kilograms | 1 | 30 |
| Manufactured ---- do | 103 | 78 |
| Salt | 4,131 | 5,330 |
| Sodium and potassium compounds, n.e.s | | |
| Stone, sand and gravel: | | |
| Dimension stone: | 25 | 221 |
| Crude and partly worked | 323 | 254 |
| Worked | -- | 2 |
| Dolomite | | |

See footnotes at end of table.

## Table 14.—Senegal: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel—Continued | | | |
| Gravel and crushed rock | | 64 | 64 |
| Quartz | | 50 | 30 |
| Sand, excluding metal bearing | | 49 | 88 |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | | 20 | 11 |
| Colloidal | | 16,323 | 23,789 |
| Sulfur dioxide | | 6 | -- |
| Sulfuric acid | | 53 | 50 |
| Talc, steatite, soapstone, pyrophyllite | | 228 | 225 |
| Other nonmetals, n.e.s.: | | | |
| Crude ores and concentrates | | 13 | 125 |
| Oxides and hydroxides of barium, magnesium, strontium | | r 903 | (1) |
| Bromine, iodine, fluorine | | 121 | 133 |
| Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s | | 233 | 49 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | | 17 | (1) |
| Carbon black | | 36 | 37 |
| Coal, all grades, including briquets | | 75 | 55 |
| Coke and semicoke | | 129 | 316 |
| Peat | | 5 | 20 |
| Petroleum: | | | |
| Crude | thousand 42-gallon barrels | r 4,802 | 4,930 |
| Refinery products: | | | |
| Gasoline | do | r 49 | 26 |
| Kerosine | do | 2 | 1 |
| Distillate fuel oil | do | 27 | 78 |
| Residual fuel oil | do | (1) | (1) |
| Lubricants | do | r 67 | 65 |
| Other: | | | |
| Liquefied petroleum gas | do | 6 | 1 |
| Mineral jelly and wax | do | 8 | 5 |
| Bitumen and other residues | do | 20 | 24 |
| Bituminous mixtures, n.e.s | do | 9 | 11 |
| Total | do | r 188 | 211 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | | 674 | 584 |

r Revised.
1 Less than ½ unit.

## SOMALIA [75]

The mineral industry of the Somali Democratic Republic contributed very little to the economy of the nation in 1974. Mineral production was largely confined to marine salt, meerschaum, sandstone block or local building, and reportedly, tin and a small amount of piezo-electric quartz.

The 1974–78 5-year plan was implemented, laying foundations for a long-range industrial policy. An estimated $631 million [76] was allotted for the plan period. A total of $421 million was to be derived from foreign loans and grants. Industrial development was to be allotted $95 million; mines, about $7 million; and the development of electricity and other sources of energy, about $2.2 million. During the 1971–73 development plan, $108.6 million was spent. Hard hit by drought for the past several years, much of Somalia's financial resources has been channeled into relief, delaying some development projects.

The trade deficit continued in 1974 at a much higher rate than in 1973. In the first quarter of 1974, exports were valued at $28.6 million compared with imports valued at $61.6 million for the same period. Early in 1974, a shortage of foreign exchange, brought about mainly by increased prices for petroleum and other imports, had forced the Government to limit imports to only essential commodities. More radical measures were adopted by mid-1974, including suspension of some import items.

During 1974, approximately 120,000 tons of petroleum products were imported, valued at $14.7 million. This compares with an estimated $3.2 million spent in 1973. Petroleum consumption was expected to substantially increase in view of planned heavy industrialization, mechanization of agriculture, and expanded general services. Consequently, the feasibility of establishing a 1-million-ton-per-year crude capacity petroleum refinery at Mogadiscio, costing about $8.6 million, has been studied. In an accord signed April 20, 1974, the refinery will be a joint Iraq-Somali project on a 50%-each basis. Iraq will furnish the currency, including Somalia's share. Somalia's loan will extend over 3 years, to be paid beginning on the date of operation. Iraq will also provide crude oil, training, management, and marketing for any exportable surplus. A major investment was also earmarked for establishing adequate oil storage facilities at strategic localities to insure reliability and continuity of oil supply. The scheme was expected to extend through the 1974–78 program period for completion.

A cement plant with a 100,000-ton capacity was planned for Berbera. An estimated $10.9 million investment was etimated for the auxiliary facilities, geological exploration, and mine development. All raw material required is located in the Berbera (Bihindule) District. The work plan for construction was to be finalized during the first half of 1974. A large gypsum deposit, consisting of 7 million tons of gypsum and anyhydrite is located near Berbera at Suria Malableh. A pilot plant utilizing this material was to have a capacity of 265 tons of calcined gypsum, 20 tons of medical plaster, and 13,000 boxes of school chalk per year.

New salt works and modernization of old salt works was also planned. Salt production is carried out along coastal areas and inland under primitive methods. The rate of production per basin varies. In the Red Sea area during the dry season, production is 60,000 quintals of salt every 10 days, but only 20,000 quintals in the wet season. In the Indian Ocean, the comparable amounts are 20,000 quintals and 12,000 quintals during the two seasons. Salt development will be confined to Merca, Chismayu, Zeila, and Berbera, with a total investment of about $900,000.

The Bulgarian and Somalian Governments were also planning a factory for treating tin. A project to set up a castings foundry and mechanical workshop was also to be realized. The Organization of United Nations for Industrial Development (ONUDI) let a contract for $10,500 to the Yugoslavic enterprise Ingra to creating a prototype foundry.[77] Construction work was to be completed in 1975. The second phase, increasing castings production to 1,500 tons per year, was proposed for the latter part of the 1974–78 program.

An investment of approximately $13 million was to be spent to increase the total

[75] Prepared by Janice L. W. Jolly.
[76] Where necessary, values have been converted from Somalian shillings (Ss) to U.S. dollars at the rate of Ss6.295 = US$1.00.
[77] Industries et Travaux D'Outremer (Paris). Somalia. V. 23, No. 256, March 1975, p. 234.

installed electrical capacity from its present level of 19,800 kilowatts to 50,300 kilowatts in 1978. A self-supporting public electric authority was to be set up to organize the supply of electricity. Most electricity is produced by thermal units, but the Fanole project will harness hydroelectric potential (5 megawatts) for the Lower Juba region. Intensive exploration for gas, oil, and other sources of energy was also planned. A survey conducted in 1972 indicated geothermal resources in a number of areas.

The UNDP continued phase 3 of its exploration efforts. Small, relatively low-grade iron ore deposits were described at Bur Gulan where 130 million tons exist, and at Dinsor in Upper Juba where about 50 million tons are reported. A Somali geophysical team was investigating the sepiolite and bentonite deposits near El Bur in the central part of the country. There was some small-scale mining of sepiolite (meerschaum). Exports of meerschaum were believed to approximate $20,000 in 1974. The Quaternary ilmenite sand deposits in the Chismaio area were estimated at more than 10 kilograms of ilmenite per ton. The reserves were estimated to be at least 180,000 tons.[78] Piezoelectric and optical quartz in commercial quantities was also found by UNDP in a belt of Precambrian rocks extending from the Ethiopian border to Burao. There are apparently three main types: Pegmatites (Wai-Wai type), quartz-feldspar veins (Mandera type), and quartz-calcite veins (Abdul Qadr type). Some mineral exploration activity is reportedly underway by COMECON (CMEA—Council for Mutual Economic Assistance) countries. Sulfur deposits were also reported at Berbera,[79] where there was less than 1,000 tons of sulfur scattered over nine sites. Geological conditions similar to those at Berbera prevail over a long stretch of the Gulf of Aden coast, and other sulfur deposits may be found there.

During 1973, a special license was granted to a Bulgarian group to investigate and reactivate the Majayahn cassiterite mines. About 100 tons of tin ore has reportedly been extracted from sites near Bosasso and Los Qoray and shipped to Bulgaria for testing and processing. The operation is the result of a $1.5 million loan extended by Bulgaria in 1972.

During 1974, UNDP completed investigation of the uranium-bearing ores in southern Somalia. The Wabo carnotite deposits in the Mudugh area were estimated to contain at least 5,000 tons of $U_3O_8$ equivalent in ores with an average grade of 0.07%. Ente Nazionale Idrocarburi (ENI), the Italian firm, holds the only publicly announced uranium concession. This concession predates the 1969 revolution. In 1973, ENI resumed its search for uranium after several years of suspended operations. The concession, located in the Mudugh region, is not yet producing commercially significant quantities of uranium. If exploitable deposits are found, ENI will negotiate terms for extraction and marketing since the present agreement only covers exploration. Another uranium deposit, discovered during the UNDP-financed mineral survey, is reportedly being tested by the U.S.S.R. There are other promising uranium zones including Mirrig, Bulale, and Hamur. Two others, Dusa Mareb and Wamole, are structurally related and, while they have been prospected less, they contain ore-grade material. Additional exploration reportedly could increase reserves twofold. All of these are sedimentary epigenetic carnotite deposits limited to Miocene lagoonal beds.

The Hammar Petroleum Company concession expired, and most of it was granted to Burmah Oil Somalia Ltd., operator for a group of investors including Adobe Africa Inc.; Petrolia International Trading and Shipping Corp. of Panama, R. P.; Home Oil Co., Ltd.; Tricentrol Ltd.; and Maersk Olieudvinding A/S. Burmah acquired 19,943 square kilometers, in which geological and geophysical work was planned for the first 2 years. CONOCO of the United States was carrying out seismic, gravity, and other field geologic surveys, employing nearly 300 people [80] in its central Somalia concession. Elf-SOMALIA spudded an offshore wildcat well near Hafun in April 1974. The well was abandoned for technical reasons on May 17 in the Cenomanian at 1,394 meters. Drilling was to resume on the location in 1975. Elf-SOMALIA and the CFP and TOTAL

[78] UNDP Phase II, 1972. Mineral and Groundwater Survey, Somalia, Interim Report.

[79] United Nations Development Program, Somalia. Mineral and Groundwater Survey (Phase II), Berbera Sulfur Deposits. Tech. Rpt. No. 1, 1971.

[80] Rocky Mountain News (Denver). Denver Native in Middle of Hunt for Oil in Somalia. April 23, 1975, p. 2.

group obtained offshore oil exploration permits near the Kenya border. Both ELF concessions (including the Hafun permit) total over 15,540 square kilometers. Deutsche Texaco AG was conducting seismic gravity and field geology studies. ENI/AGIP holds both onshore and offshore concessions.

## SOUTHERN RHODESIA [81]

Southern Rhodesia continued to be an important mineral-producing country despite the economic sanctions levied against it by the United Nations. The value of mineral output increased 22% over that of 1973, totaling R$165.2 million.[82] The volume of mineral production decreased 4.3% in 1974, the first decrease since before the Unilateral Declaration of Independence (UDI) in 1965. The slowing world economy and increasingly adverse exchange rates helped create the situation.

Exports continued despite the sanctions, though usually at less than world prices. The 1972 U.S. exception of chromite, nickel, and other strategic minerals from economic sanctions via the Byrd Amendment to the Military Procurement Act was still a matter of controversy during the year, but no action to repeal it had been effected by yearend. A vote on the issue by the U.S. House of Representatives was expected in mid-1975.

Registration of new mining and quarrying companies in 1974, with nominal capital of $3,204,250, totaled an alltime high of 56. Two mining companies increased their registered capital by $17,661,000 in 1974, the largest monetary increase since 1968. The contribution of the mining and quarrying industries represented nearly 7.2% of the GDP of $2,941.4 million in 1974.

Over 61,600 persons were employed in the mining and quarrying industries in 1974, a 6% increase over that of 1973.

Interest in minerals exploration continued high during the year, especially for gold, as new exclusive prospecting orders and extensions exceeded revocations, withdrawals, and forfeitures. At yearend, 64 exclusive prospecting orders were in effect, up over 40% from that of 1973. Most of these were for copper and gold, but also included most of the minerals mined in Rhodesia. Many small gold mines came into production in 1974 (61 from January 1 to July 1, 1974) because of the dramatic increase in the price of gold worldwide. A total of 43 exclusive prospecting orders were granted in 1974, and 26 of those were primarily for gold.

Rhodesia supplied 5,689 million kilowatt-hours of electrical energy to the Central African Power Corp. (CAPCO) grid and withdrew 5,310 million kilowatt-hours. Energy from CAPCO plus 310 million kilowatt-hours from public and private noninterconnected stations brought total electrical energy consumed in Rhodesia to 5,620 million kilowatt-hours, an increase of 7% over that of 1973. The mining and quarrying industries consumed 19% of the total in 1974, the same as in 1973.

### COMMODITY REVIEW

**Metals.**—*Chromium.*—Exports of chromite and ferrochromium to the United States in 1974 were as follows:

| | Gross weight (tons) | Value |
|---|---|---|
| Chromite, not more than 40% chromic oxide | 4,702 | $105,792 |
| Chromite, 46% or more chromic oxide | 60,234 | 2,445,348 |
| High-carbon ferrochromium | 26,494 | 6,519,610 |
| Low-carbon ferrochromium | 4,499 | 2,258,135 |
| Ferrochromium-silicon | 2,983 | 1,053,192 |

Latest reports indicate that the large-scale ferrochromium smelter being built by Rio Tinto (Rhodesia) at its technical headquarters in Effel Flats should be completed by 1975. A permanent plant was scheduled to be erected at a later date. Rail facilities and electricity are available, and water will be supplied from the new Claw Dam.

The world's second-largest reserve of chromite is in Rhodesia, totaling about 560,000,000 tons or about one-third of the total world reserves. Rhodesia has the world's largest reserves of high-quality chromite.

*Copper.*—Total metal content recovered

[81] Prepared by Larry J. Alverson, Industry economist, Division of Ferrous Metals.

[82] Where applicable, values have been converted from Southern Rhodesian dollars (R$) to U.S. dollars at a rate of R$1 = US$1.75.

from ores produced by subsidiaries of Rhodesia's largest copper producer, Messina (Transvaal) Development Company Limited, was approximately 33,000 tons, a slight decline from the 1973 total. Ore production at the Mangula mine of M.T.D. Mangula Ltd. declined 3% to 1,299,000 tons and, although the total minable reserves remained unchanged at 15 million tons, dilution of the ore in the upper section of the mine caused the grade of the extracted ore to drop to 1.1% copper. Concentrate produced contained 13,284 tons of copper, a decrease of 8% from that of 1973. A shortage of sulfuric acid resulted in a shutdown of the mine's leach plant for 6 months of the year; however, 1,057 tons of metal in copper cement was recovered. When the supply of the acid was restored in July, the plant was reopened and a total of 240,000 tons of ore assaying 0.77% copper was stacked for leaching. Production during the third year of operation at Mangula's Silverside mine declined 5% to 193,000 tons of ore averaging 1.22% copper. Concentrate produced contained 1,598 tons of copper, a decrease of 21% from that of 1973, due to delays in commissioning the winding equipment at the concentrator. Mining further depleted oxide ore reserves to 190,000 tons. Sulfide ore reserves were reassessed at 390,000 tons averaging 1.67% copper. In contrast to Silverside's declining performance, the company's Norah mine improved both its production and reserve position during the year. Ore production climbed 9% to 257,000 tons averaging 1.2% copper. Concentrate produced contained 2,918 tons of copper, an increase of 22% over that of 1973. Development drilling increased proven sulfide ore reserves 9% to 1,890,000 tons grading 1.36% copper. Lomagundi Smelting and Mining (Pvt.) Ltd., another subsidiary of Messina, operated three copper mines in Rhodesia during the year. The company's Gwai River mine increased ore production 4% to 176,000 tons with an average copper content of 0.79%. However, copper contained-in-concentrate produced at the mill declined 18% to 1,289 tons. Considerable development work at the mine failed to increase proven reserves; they declined 8% to 216,000 tons averaging 1% copper. The company's Shackleton mine produced a record high of 619,000 tons averaging 1.83% copper, an increase of 14% from that of 1973. Copper contained-in-concentrate produced in the mill was 10,548 tons, an increase of 1,779 tons, or 20%, over that of 1973. Proven ore reserves were 1,503,000 tons averaging 2.14% copper.

The Alaska mine increased its copper ore production by 34,000 tons to 305,000 tons at an average grade of 0.95% copper. The copper content of concentrate produced at the mill declined 16% to 2,091 tons, however. Proven reserves at the mine markedly increased to 938,000 tons assaying 1.19% copper through the inclusion of large low-grade ore bodies.

Metal content of ore produced at the Inyati and Muriel copper mines of the Coronation Syndicate Ltd. totaled 6,695 tons, a 9% decline from that of 1973. The Inyati mine continued to account for most of the production.

*Gold.*—The four mines of the Coronation Syndicate Ltd. (Arcturus, Inyati, Mazoe, and Muriel) produced 63,784 troy ounces of gold during the year, a decrease of 29% from that of 1973. However, profit before taxes for the group (including copper operations) increased to R$9,900,000 from R$6,020,000 in 1973, an increase of over 64%, because of a worldwide increase in the price of gold.

The continued rising price of gold spurred further interest in reopening old gold mines and prospecting for new ores. A total of 61 new gold mines came into production in the first 6 months of 1974.

Falcon Mines Ltd., which includes the Dalny, Arlandzer, Delcia, Beehive, Turkois, and Venice gold mines, produced a total of 230,720 troy ounces for the year ending September 30, 1974, compared with 212,900 troy ounces in 1973. Development advanced 6,470 meters during the year for all the mines combined. Development westward in the Dalny, the most lucrative mine of the group, continued throughout the year on levels 19 to 29. Sampling results were generally satisfactory, and the high-percentage payability of the ore body was a feature of the year's work. Profit for the group was nearly $4.3 million.

The roasting plant at Que Que, which has been on a maintenance basis since 1970, was recommissioned in May 1974. With the increase in the free-market price of gold, operations have resumed at numerous gold mines. This made available a considerable amount of refractory con-

centrates, which led to the decision to recommission the plant. A scheme was developed whereby all suppliers of concentrate share in the actual proceeds from the gold recovered in proportion to the gold contained in their concentrates. Attention was also being given to the possibility of re-treating existing dumps at the plant, since this has been indicated as potentially profitable. The value of recovered gold was expected to be in the vicinity of $1,750,000 per year.

*Nickel.*—Work advanced on diamond drilling and prestripping ore bodies at the nickel mine of Shangani Mining Corp. which is 55.2% owned by Johannesburg Consolidated Investment Company Ltd. (JCI) with Rhodesian Nickel Corp. having a 36.8% interest. Excavation of the river-diversion canal was nearly completed, and building of the African township was started. Work on the European township and main water-supply line from the Tiyabenzi Dam was scheduled for 1975. The open pit will eventually be 650 meters long by 350 meters wide and 120 meters deep. The deposit contains east and west ore bodies, with the east ore body containing about 15 million tons of ore. After allowing for dilution, it was estimated that the mine will yield more than 19 million tons of ore with an average mill grade of 0.78% nickel. Production is planned to be between 5,000 and 6,000 tons per year of nickel with a milling rate of 75,000 tons per month of ore.

JCI was experiencing serious underground water difficulties with the exploratory shaft at its vast nickel depoits near Damba. Reportedly, if the deposits are as large as expected, the project could become larger than the over $20 million Shangani complex.

Work on the Epoch nickel mine of Trojan Nickel Ltd. continued in 1974. Installation of water and electricity was completed, and temporary sinking hoists and a headframe were erected. Two 3-meter circular shafts were being drilled to a final depth of 312 meters, at which time permanent hoists and a headframe will be installed, and development will begin. Reserves of 2.5 million tons of ore grading 0.75% nickel have been indicated by drilling samples. Other zones indicated further tonnage of high-quality ore.

Exports of nickel to the United States in 1974 totaled 1,726 tons valued at $5,629,058.

*Tungsten.*—The Beardmore Mine of Messina ceased mining operations in April 1974 when ore reserves were depleted. The plant was changed to retreat slimes and sands. Of the underground production of 16,400 tons of ore at 0.67% tungsten trioxide ($WO_3$), 1,000 tons of waste was sorted and 15,400 tons assaying 0.71% was milled. In addition, 13,000 tons of slimes and 16,000 tons of sands with a $WO_3$ content of 0.54% and 0.21%, respectively, were treated. Recoveries were 32.3% for the slimes plant and 42.2% for the sand plant. Production totaled 203 tons of scheelite concentrate containing 115 tons of $WO_3$. It was expected that the stockpile of sands and slimes, which can be economically re-treated, will be depleted by December 1974.

**Nonmetals.**—*Asbestos.*—Exports of crude asbestos (chrysotile) to the United States totaled 1,558 tons valued at $1,009,484 compared with 767 tons valued at $423,478 in 1973. Most of the production came from four mines of the Rhodesian and General Asbestos Corp. (Pvt.) Ltd. and Pangani Asbestos Mines (Pvt.) Ltd. Production in 1974 totaled an estimated 100,000 tons. According to a United Nations Security Council report, estimated 1973 production totaled 165,000 tons.

Block caving is the most favored method of mining asbestos in Rhodesia, with the main alternative being sublevel caving. Most mines begin as surface quarries and are eventually converted to underground operations as the overburden-to-ore ratio increases beyond economic limits.

*Phosphate.*—A $5,250,000 extension to the Dorowa phosphate mining complex of A.E. & C.I. Rhodesia Ltd. was inaugurated on July 1974. The phosphate-bearing mineral at Dorowa is apatite, which is mined in a large open pit about 40 miles south of Inyazura. Construction of the Dorowa plant began in 1964 and the phosphate concentrator opened the next year. New extensions to the plant increased capacity over 50%. The new plant incorporates the latest in milling and flotation equipment; one feature is a wet autogenous mill, which is the largest in Rhodesia and can process 185 tons per hour of ore. The design capacity of the concentrator is 180,000 tons per year of concentrate, while the plant treats nearly 1,700,000 tons per year of

ore. It uses 5,000 cubic meters of water per day, with about 10 tons of ore required to produce 1 ton of concentrate.

**Mineral Fuels.**—*Coal.*—A report published in Rhodesia indicated a total probable reserve of 2.5 billion tons of coal, of which about 755 million is considered extractable from both open pit and underground operations. Of the extractable coal, 59% is low in ash, suitable for making coke. Of the open pit reserves, 81%, or 220 million tons, is high-ash coal suitable for steam raising. In addition, there is a possible resource of about 5 billion tons of coal and possible large resources of carbonaceous shale with up to 60% ash. Low-ash coal, suitable for the production of coke, is not likely to be found outside the Wankie District and the coalfields of the Limpopo and Sabi Valleys.[83]

Coal sales of Wankie Colliery Corp. Ltd., Rhodesia's only coal producer, were 2,794,000 tons, nearly the same as in 1973. Coke sales totaled 267,000 tons, an increase of 13% from that of 1973.

Wankie hoped to commission the second stake of the coke ovens at its No. 2 colliery by yearend 1974. It provides for the coal to be heated prior to being fed into the ovens and should lead to a marked increase in output.

*Gas.*—Rhodesia's first coke gas-producing plant was brought into full commercial operation in August 1974. This development was expected to play a significant role in the country's economy by reducing oil imports, providing a new industry and employment, and increasing the sale of Wankie coke by as much as 50,000 tons per year. The plant is capable of producing 5,000,000 Btu per hour. It is anticipated that more than 100 major mining and industrial complexes presently using oil will draw their energy sources from coke-produced gas.

*Petroleum.*—Rhodesia was planning an exploratory drilling program for oil in the Matabeleland Province for late in the year. Goldfields Prospecting Company (Pty.) Ltd. will conduct the search, which will cover more than 48,000 hectares in the Bulawayo and Victoria mining districts. Rhodesia currently imports all of its oil needs since there is no domestic production.

## SPANISH SAHARA[84]

The phosphate deposits of Bu-Craa are located in the northern area of the Spanish Sahara, about 197 kilometers southeast of El Aaiun, the capital of the province, and 100 kilometers from the Atlantic coast. The principal mineral produced in the Spanish Sahara is phosphate rock from the Bu-Craa mine. Production in 1974 was 2,300,000 tons, of which 2,179,200 tons was exported. This was an increase of 230.3% over the level of production of 696,400 tons in 1973 and a major improvement over the 150,000 tons produced in 1972 when mining started.

The company was renamed in 1969 from Empresa Nacional Minera del Sahara, S.A., to Fosfatos de Bu-Craa, S.A. (Fosbucraa), after the phosphate deposit was confirmed. Fosbucraa is a wholly-owned subsidiary of the Spanish Government's Instituto Nacional de Industria.

A drilling and sampling program has confirmed 1.7 billion tons of reserves under an area of 231 square kilometers. The thickness of the mineral deposit ranges from 2.5 to 7 meters. Reserves were determined on the basis of concentrates ranging from 31% to over 36% $P_2O_5$. The average $P_2O_5$ of the phosphate rock produced in 1974 was 36.04%.

A majority of the phosphate rock produced in the Spanish Sahara is exported to Spain. When Moroccan phosphate rock shipments to Spain were reduced in 1974 to 25% of those shipped in 1973, shipments of Saharan phosphate rock to Spain were increased. By government regulation, Spanish Sahara rock shipments to Spain can only be carried in Spanish flagships and inadequate domestic shipping capacity caused some backup at the port of El Aaiun. The rivalry for control of the phosphate deposits in the Spanish Sahara was emphasized by claims of both Morocco and Mauritania of sovereignty over Spanish Sahara. Under a 1966 agreement with the United Nations, Spain plans to relinquish control and assist the inhabitants to

[83] Hodgson, W. A. Coal Resources of Rhodesia. Sixth Annual Report. Institute of Mining Research, University of Rhodesia, Salisbury, Rhodesia, January 1975, pp. 30–32.

[84] Prepared by William F. Stowasser.

determine their own future. These problems have not been resolved and it is probable that the reported [85] sabotage of the conveyor belt that carries phosphate rock from the mine at Bu-Craa to the port of El Aaiun, interrupting operations during the month of November, was caused by a guerilla faction.

At the Bu-Craa mine, a "walking" dragline with a 60-cubic-yard-capacity bucket strips the overburden from the mineral deposit. Either a bucketwheel excavator or electric shovel is used to excavate the ore and load 100-ton-bottom-dump trucks used to carry the ore to the primary crushing plant at the mine. The coarse fraction, plus 10 millimeters, is screened out and wasted. The undersize is conveyed a distance of 100 kilometers to the beneficiation plant at El Aaiun. The phosphate ore is subjected to secondary crushing followed by washing in trommels with seawater. The ore is classified on screens and in cyclones to separate sands and slimes from phosphate-bearing nodules. The concentrates are centrifuged with fresh water and dried in fluid-bed kilns. The product is dry-screened to obtain a final classification.

The plant is being expanded. Production projections are 4 million tons for 1975 and between 5 million and 6 million tons in 1976. In 1975, the company will decide on an additional expansion program to increase the capacity of the mine and beneficiation plant to 10 million tons per year.

## SUDAN [86]

The mineral industry of Sudan continued to be a minor part of the nation's largely agricultural economy. Over 85% of the population is engaged in agriculture (mainly subsistence) and livestock raising. Cotton was the most important cash crop, accounting for about 40% of the total export value. GDP was estimated at $1,746 million [87] for 1974, representing a 5% improvement over that of 1973. The contribution of mining to the GDP was very small. Mining was mainly confined to small-scale gold operations, a salt industry based on solar evaporation of Red Sea water, and building stone, gypsum, mica, talc, and chromite mining. Oil was discovered in central Sudan and off the Red Sea coast, new cement plants and a new refinery were being planned, and there was renewed interest in gold mining.

During 1974, inflation of over 20% was reported to have affected fuel and consumer goods prices. The trade deficit continued with imports of food being the chief cause. Imports were 62% higher in 1974 than in 1973, and were expected to grow an average of 25% per year over the next 5 years, reaching $1.2 billion by 1980.[88] A fall in export commodity demand markedly reduced Sudan's export receipts for 1974. Total exports for 1974 were valued at $438.5 million, and imports were valued at $655.5 million. Mineral exports, excluding petroleum refinery products, were valued at $1.8 million. Chrome ores, valued at an estimated $831,671, were exported to Switzerland, the People's Republic of China, and Japan. Building stone valued at an estimated $207,931 was shipped to the Federal Republic of Germany. India was Sudan's fifth-largest goods supplier during the first half of 1974, but an announcement to halt the trade agreement with India was made in July. A trade agreement between Czechoslovakia and Sudan was signed in December 1974.

Exports of refinery products were valued at $17.1 million, including reexports. Imports of petroleum products were valued at an estimated $85.5 million in 1974, compared with $23.9 million in 1973 for a similar amount imported. Crude oil imports amounted to 1,160,941 tons in 1974. Sudan signed an agreement with the Iranian Government in May 1974 for furnishing crude petroleum. Under this agreement, Sudan will import 1.2 million tons of crude oil valued at $100 million. Sudan was to pay $35 million in cash, and the remaining $65 million was to be in the form of a 5% interest loan. The first installment was to be due on April 1, 1978.[89]

Investment incentives were further lib-

[85] Fertilizer International. Fosbucraa Conveyor Sabotaged Again. No. 66, December 1974, p. 1.
[86] Prepared by Janice L. W. Jolly.
[87] Where necessary, values have been converted from Sudanese pounds (£S) to U.S. dollars at the rate of £S1=US$2.87.
[88] U.S. Embassy, Khartoum. State Department Airgram A-26, May 31, 1975, p. 8.
[89] Al-Ayyam (Khartoum). Signing of Agreement between Sudan and Iran to Furnish Our Petroleum Requirements Valued at $100 Million for a Year. May 3, 1974, p. 1.

eralized in 1974, and in early 1975 foreign banks for the first time since 1972 were encouraged to return to the Sudan for all but local commercial banking. Foreign banks were to operate in foreign trade facilities or in financing development projects, and in long-term and medium-term financing. The demands of inflation, development, and consumption were causing a strain on Sudan's money reserves. The country's international liquidity continued to drop by a reported 9% [90] during 1974. Even so, plans and loans were being made for badly needed development projects. The Government allocated approximately $290 million for development projects in 1973–74, and $603 million in 1974–75. The Railway Authority development budget for 1974–76 was planned at about $157.8 million.[91] The main link between the most productive areas of Sudan and the Red Sea is the narrow-gauge Sudan Railway system, already much overextended in use. A $24 million IDA loan was aimed at modernizing the railroad with a large number of U.S. made diesel locomotives and other equipment due for delivery in 1975.

There were only about 300 kilometers of asphalted roads in the country. There was great congestion at Port Sudan (the only port), which was expected to increase as the Suez Canal opened. With aid from the United Kingdom of $24 million, a 996-kilometer highway was being constructed between Wad Medani to Port Sudan via Gedaref, Kassala, and Haiya, and was expected to be finished by 1978. The road along the coast between Port Sudan and Suakin would be inaugurated by March 1976. The Kosti bridge was expected to be completed by 1978, and the Kosti-El Obeid road, 217 kilometers long, was to be repaved. Relief would also soon be afforded by the new oil products pipeline being built with Kuwaiti aid from Port Sudan to Khartoum, which was expected to be finished by June 1976. A new port south of Port Sudan and improvement of river services were also planned. A study by the Kuwait Fund suggested $2.9 billion in transport expenditures was needed over a 12-year period.

The World Bank agreed to lend $23 million through the IDA to finance electric power expansion. This was a contribution towards a $40-million project to provide additional electrical facilities for industrial and agricultural development over the next 5 years. Federal Republic of Germany was also to loan $48 million for various projects including a hydroelectric complex at Juba, and roads between Wau, Tonj, Rumbek, and Juba, and between Wau, Tambura, and Yambio. Great Britain granted a loan of $7.2 million to build a cement factory at Kappeta and an electric power station at Malakal, and to use in several agricultural projects. Egypt and Sudan reached agreements for the formation of joint companies for exploiting mineral resources in both countries, and for appropriating $1.4 million toward road and rail projects linking Egypt and Sudan. Sudan was also among 24 states that, in August 1974, set up the Islamic Development Bank with an initial capital of about $900 million to help the economic and social development of Islamic countries and communities. The Arab Investment Company, established in June 1974 with capital of $200 million, has also been giving help to Sudan for a number of projects.[92]

Electrical power, mostly from hydroelectric generators, was expected to attain 253 megawatts in 1974–75. New electric generators were to be constructed at Bari, Kilometer 10, Madani, Atbarah, and Port Sudan. A thermal unit, financed by the African Development Bank (BAD) was to be constructed at Juba.

A general shortage of cement occurred in Sudan in 1974, curtailing construction and tripling the price of cement. Kordofan Province alone needs 150,000 tons of cement per year from the present facility at Raik. Because of transportation difficulties, however, no more than 20,000 tons were shipped. In 1974, 300,000 tons of cement were produced valued at an estimated $9 million. It was announced that Cement Production (Sudan), a Sudanese company with part United States and Saudi Arabian ownership, was to build a plant costing $40 million to produce approximately 400,000 tons per year at Msersa Arakiyia on the Red Sea, 32 kilometers north of Port Sudan. Two U.S. firms, Buttes Gas and Oil and KH International, and the Saudi conglomerate, Triad, will provide $10 million. The rest was to be supplied

[90] Quarterly Economic Review (London). Sudan. No. 3, 1975, Economic Review of Sudan, Sept. 8, 1975, p. 15.
[91] Al-Ayyam (Khartoum). (Railway Budget). Jan. 30, 1975, p. 1.
[92] The Petroleum Economist. Meeting Africa's Oil Bill. V. 13, No. 6, June 1975, p. 222.

by a United States-British banking consortium. The plant will take 15 months to build and will utilize local deposits of gypsum and calcium obtained from Red Sea coral. It was estimated that available raw materials could supply 1 million tons per year for 1,000 years. Part of the plant's output was planned for export. The gypsum deposits along the coast of the Red Sea north of Port Sudan were described in a recent report.[93] Deposits of Miocene age occur in three districts containing approximately 92 million tons. A team of West German experts from the Gluckner Co. also arrived in January 1974 to study the technical and economic feasibility of the southern region cement project to be carried out in Equatoria Province. The preliminary studies will last about 4½ months. The new plant will provide cement needs for the southern region.

Transportation has been the major constraint in the exploitation of known mineral resources. UNDP has been providing assistance to the Government in mineral exploration since 1967, originally covering three areas involving a number of minerals; activities were then limited to copper exploration in Hofrat en Nahas and to asbestos exploration in the Ingessana Hills. More recent efforts have been concentrated on ground water exploration. A budget of $5.7 million was allocated for geological studies and mineral exploration to cover 150,000 square kilometers[94] along the Red Sea. Investigations were to include iron, gold, and gypsum deposits known to occur in the area. Many gold veins occur in the Jubayt al-Ma'adin area over 7 square kilometers. Zinc mineralization estimated at 222 million tons was reported in the Ayit area, north of Port Sudan. The Gebeit gold mine, located in north Red Sea Hills, probably was worked as long ago as 3,500 years.[95] At least several hundred thousand ounces have been produced from the mine. In recent times, it has been the biggest and most efficiently worked of the Sudan gold mines.

Chevron, a Standard Oil Co. of California subsidiary, reportedly secured 39 concessions for oil prospecting in the southern Red Sea region and, on November 23, 1974, secured an additional 645 licenses covering 516,000 square kilometers in the southern interior. All of these awards were under the Petroleum Resources Act of 1972, which provides for 6 years of exploration and a government option of 50% in case of discovery. Chevron was also to share in exploration of three areas awarded to American Pacific International in 1974, as well as obtaining a 37.5% share (along with Texaco, which also acquired a 37.5% share) in the Red Sea concession held by Ball and Collins of the United Kingdom. Chevron was the operator of this concession. Ball and Collins was awarded 17 licenses covering 13,600 square kilometers on January 30. In early 1975, oil was discovered in central Sudan and off the Red Sea coast. Chevron Overseas Petroleum, which was operating in the area, indicated oil occurred in commercial quantities around the Suakin archipelago and that offshore drilling would begin in 1976. Gas had also been discovered in the Red Sea, and test drilling was expected to begin at yearend 1975. Hunting Geology and Geophysics of the United Kingdom was to do a program of areomagnetics, photography, and satellite mapping for Chevron, covering an area of 321,000 square kilometers in southern Sudan. Sudanese Resources Development Corp. (a subsidiary of Oceanic Exploration Co.) was awarded 18 licenses.

A refinery with a capacity of 200,000 barrels per day of crude oil, representing an investment of nearly $300 million, was to be established at Port Sudan. The refinery will be an enterprise shared by the Sudanese state and Triad Naft of Saudi Arabia.

[93] Medani, A. H. Preliminary Account of the Gypsum Deposits of the Sudan. Econ. Geol., v. 69, 1974, pp. 693–696.

[94] Al-Ayyam (Khartoum). Operations of Prospecting for Minerals in 150,000 Square Kilometers Along the Red Sea. Feb. 2, 1975, p. 1.

[95] Boushi, Ismail M. El. Geology of the Gebeit Mine, Democratic Republic of the Sudan. Econ. Geol., v. 67, 1972, pp. 481–486.

## Table 15.—Sudan: Exports and reexports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Copper metal including alloys, scrap | 60 | 10,509 |
| Iron and steel metal: | | |
| Scrap | 6,484 | 3,927 |
| Semimanufactures | 8 | -- |
| Lead metal including alloys, scrap | 150 | 238 |
| Manganese ore and concentrate | 1,370 | 369 |
| Zinc metal including alloys, scrap | 26 | 34 |
| Other: | | |
| Ore and concentrate of base metals, n.e.s | 19,250 | 5,000 |
| Nonferrous metal scrap, n.e.s | 94 | 1,563 |
| Precious metal scrap ---- troy ounces | -- | 2,058 |
| NONMETALS | | |
| Cement | 25 | 37 |
| Salt | 1,259 | 346 |
| Sodium carbonate, natural | r 47 | 37 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Petroleum refinery products: | | |
| Gasoline ---- thousand 42-gallon barrels | 131 | 3 |
| Kerosine ---- do | (1) | (1) |
| Jet fuel ---- do | r 210 | 164 |
| Distillate fuel oil ---- do | (1) | -- |
| Residual fuel oil ---- do | (1) | 134 |
| Lubricants ---- do | 1,178 | 2,127 |
| Total ---- do | 1,519 | 2,428 |

r Revised.
1 Less than ½ unit.

## Table 16.—Sudan: Imports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| METALS | | |
| Aluminum: | | |
| Oxide and hydroxide | (1) | -- |
| Metal including alloys, unwrought and semimanufactures | 522 | 1,848 |
| Copper metal including alloys, unwrought and semimanufactures | 845 | 244 |
| Iron and steel metal: | | |
| Scrap | 2 | -- |
| Pig iron, ferroalloys, similar materials | 57 | 164 |
| Steel, primary forms | 85 | 14 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections | 20,720 | 45,455 |
| Universals, plates, sheets | 19,314 | 31,442 |
| Hoop and strip | 2,581 | 4,843 |
| Rails and accessories | 711 | 214 |
| Wire | 675 | 12,064 |
| Tubes, pipes, fittings | 8,333 | 5,781 |
| Castings and forgings rough | 675 | 62 |
| Lead metal including alloys, unwrought and semimanufactures | 371 | 386 |
| Nickel metal including alloys, unwrought and semimanufactures | 1 | 6 |
| Platinum-group metals including alloys, all forms ---- troy ounces | 643 | -- |
| Silver metal including alloys, all forms ---- do | -- | 6,591 |
| Tin metal, including alloys, unwrought and semimanufactures ---- long tons | 121 | 835 |
| Zinc metal including alloys, unwrought and semimanufactures | 623 | 773 |
| Other: | | |
| Oxides, hydroxides, peroxides of metals, n.e.s | 35 | 684 |
| Base metals including alloys, all forms, n.e.s | -- | 3 |
| Oxides of zinc and lead, not separated | 635 | 90 |
| Oxides of manganese, iron, cobalt, titanium, not separated | 224 | 531 |
| NONMETALS | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc | 90 | 113 |
| Dust and powder of precious and semiprecious stones | 6 | 21 |
| Grinding and polishing wheels and stones | 23 | 94 |
| Asbestos | -- | 6 |

See footnotes at end of table.

## Table 16.—Sudan: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| NONMETALS—Continued | | |
| Cement | 518 | 6,470 |
| Chalk | 1,015 | 826 |
| Clays and clay products (including all refractory brick): | | |
| Crude clays, n.e.s | 396 | 326 |
| Products: | | |
| Refractory (including nonclay bricks) | 667 | 734 |
| Nonrefractory | 779 | 75 |
| Fertilizer materials: | | |
| Crude, phosphatic | -- | 30 |
| Manufactured: | | |
| Nitrogenous | 193,589 | 178,395 |
| Phosphatic | 300 | 787 |
| Potassic | 8 | -- |
| Ammonia | 49 | 91 |
| Graphite, natural | 8 | 3 |
| Gypsum and plasters | -- | 300 |
| Iodine | 11 | -- |
| Lime | 882 | 1,486 |
| Mica, crude, including splittings and waste | 5 | 2,040 |
| Pigments, mineral, natural, crude | 184,578 | 481,292 |
| Precious and semiprecious stones, except diamond ---- thousand carats | 515 | -- |
| Salt | 63 | 28 |
| Sodium carbonate, natural | r 359 | 347 |
| Sodium and potassium compounds, n.e.s.: | | |
| Caustic soda | 3,752 | 8,194 |
| Caustic potash, sodic, and potassic peroxides | 2 | 2 |
| Stone, sand and gravel: | | |
| Dimension stone ---------- value | r $5,602 | $75 |
| Sand, excluding metal bearing | -- | 51 |
| Sulfur: | | |
| Elemental, all forms | (1) | 179 |
| Sulfuric acid | 372 | 299 |
| Other nonmetals, n.e.s: | | |
| Crude | 317 | 83 |
| Bromine, chlorine, fluorine | 34 | 75 |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 3,123 | 2,754 |
| MINERAL FUELS AND RELATED MATERIALS | | |
| Asphalt and bitumen, natural | r 2,198 | 366 |
| Carbon black | 5 | 34 |
| Oxygen, nitrogen, hydrogen, rare gases | (1) | 10 |
| Petroleum: | | |
| Crude and partly refined ---------- thousand 42-gallon barrels | 3 | -- |
| Refinery products: | | |
| Gasoline: | | |
| Motor ---------- do | 862 | 851 |
| Aviation ---------- do | 147 | 224 |
| Kerosine ---------- do | 697 | 583 |
| Distillate fuel oil ---------- do | 2,358 | 2,619 |
| Residual fuel oil ---------- do | 1,309 | 1,351 |
| Lubricants ---------- do | 237 | 179 |
| Other: | | |
| Liquefied petroleum gas ---------- do | 33 | 37 |
| Mineral jelly and wax ---------- do | 2 | 2 |
| Bituminous mixtures, n.e.s ---------- do | 5 | 43 |
| Unspecified ---------- do | (1) | (1) |
| Total | 5,650 | 5,889 |
| Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals | 153 | 265 |

r Revised.
1 Less than ½ unit.

## SWAZILAND[96]

The mineral industry of Swaziland made a significant contribution to the national economy in 1974, providing about 11% of the estimated GDP of $184 million.[97] Minerals produced were iron ore ($11.1 million), asbestos ($8.3 million), coal ($718,269), kaolin ($35,319), barite ($20,975), pyrophyllite ($322), and tin ($2,757). Iron ore production exceeded that of 1973, even though transportation problems caused by port congestion and delays in railroad shipments in Mozambique severely curtailed movement of iron ore during the latter part of 1974. Other problems for the mineral industry were caused by inflation, a result of the rise in prices for imported petroleum. In terms of value, 1974 imports ($115 million) were $16.8% above the 1973 level. Petroleum products valued at $12.4 million were imported in 1974 and formed approximately 11% of the total import value. Even so, Swaziland recorded a favorable balance of payments for 1974. Items for export were valued at an estimated $173 million; iron ore and asbestos formed approximately 11% of the total estimated value.

On September 6, Swaziland instituted its own currency, the Emalangeni, although it will remain a member of the South African Customs and Currency Union, which includes Botswana, Lesotho, and the Republic of South Africa. An agreement was signed on December 5 with the Governments of Lesotho and the Republic of South Africa that reinforced valuable past financial relationships, but established each country as sole authority responsible for its own exchange transactions within context of a mutually determined policy. In addition, Swaziland was a signatory to the Lome Convention February 18 in Togo, opening up the European market to its products.

The Small Enterprises Development Corporation (Sedco) was to establish a small foundry at Manizini Estate. It would be the first foundry in Swaziland and would be utilized for both ferrous and nonferrous castings. Local sand will be used in making molds. The first prototype was planned for completion in 1975. An investment of $74,500 was visualized. Production at the newly established Swaziland Chemical Industries (Pty.) Ltd. fertilizer plant at Matsapa was expected to start at the end of 1974. It will produce up to 4,000 tons per month. Koer Industries Limited of Israel was to open a ceramics factory utilizing local kaolin from Sicunsa. Employment for over 200 people was visualized. Various studies concerning the proposed thermal power station continued. The Swaziland Collieries concession at Mpaka was being drilled to establish quality and quantity of coal required.

The publication of the Mineral Rights Taxation Order in 1973 resulted in the relinquishing of undeveloped mineral rights covering approximately 1,230 square kilometers, which became available to new applicants. Early in 1974, exclusive prospecting licenses were granted to Shell Coal (Swaziland) Ltd. and Sir Alfred McAlpine and Sons Ltd. for exploration over large parts of the coalfields. Shell agreed to spend $447,000 and begin prospecting within 3 months. The geochemical reconnaissance sampling was continued by the Geological Survey and Mines Department. Results from an area in central Swaziland covering 2,600 square kilometers were reported.[98] Cominco and De Beers both continued prospecting in their respective areas, granted in 1973. Investigations of talc, calcite, and clay deposits were made during 1974 and small-scale production was hoped for in the near future. By yearend 1974, a start had been made on opening up and sampling the dormant Piggs Peak gold mine where the lower three levels have been flooded. The pyrophyllite mine near Sicunusa was closed during 1974 because of the poor quality of the product.

The Swaziland Geological Survey and Mines Department was continuing to review the overall iron ore situation and had recently summarized much of the previous work.[99] The following resource data were indicated for Swaziland's low-grade iron deposits: Swaziland Iron Ore Development Company (SIODC) lease

[96] Prepared by Janice L. W. Jolly.

[97] Where necessary, values have been converted from Swaziland Emalangeni (E) to U.S. dollars at the rate of E1=US$1.49.

[98] Swaziland Ministry of Industry, Mines, and Tourism. Annual Report of the Geological Survey and Mines Department For The Year Ended Dec. 31, 1973, p. 33.

[99] Swaziland Ministry of Industry, Mines, and Tourism, Quart. Bull., v. 2, April 1975, pp. 9–12.

area, 58.5 million tons at 43.2% Fe; north of SIODC lease area, 67.9 million tons at 31.7% Fe; Piggs Peak and Havelock area, 300 million tons at 35% Fe; and southern Swaziland (Maloma and Gege), 150 million tons at 30% Fe. This represents a total of 576.4 million tons with an average 34.2% Fe. The results of Anglo American's investigation into the feasibility of mining the low-grade, banded iron formation of the northwest highlands were received by the Geological Survey and were reportedly as discouraging as those received following the UNDP study in 1971.[1] There were two main adverse factors—difficult beneficiation caused by the frequent occurrence of magnetite and hematite as intimate irregular intergrowths, and the high cost of transportation. Investigations were planned for other iron deposits at Maloma, Gege, and in the valley of the Mkhondo River north of Hlatikulu. The feasibility of producing sponge iron or steel within Swaziland was also to be considered.

At SIODC's Ngwenya mine, an average of 521 people were employed with earnings totaling $1.5 million for 1973. The high-grade ore mined at Ngwenya contains between 62% and 65% iron with small amounts of silica, alumina, arsenic, phosphate, and titanium. Medium-grade ore, which is to be exported to Japan between 1975 and 1978 will contain a minimum of 59% iron and 1% manganese. The initial contract with Nippon Steel Corporation of Japan to supply 15 million tons of high-grade iron ore over a 10-year period expires March 1975. In 1970, a second major contract was signed to provide the same Japanese firm with 6 million tons of medium-grade iron ore over a 3-year period beginning in 1975. Owing to recent inflationary pressures, a revision in price was deemed necessary, was negotiated, and a contract was signed late in 1974. One problem for SIODC was that the price agreed upon in 1974 was close to the break-even point, making it critical that the mine move 6,000 tons of ore daily to Lourenço Marques for export.[2] Transportation costs were high in 1974, caused in part by disturbances and irregularity in shipments through Mozambique. The South African railways was studying the possibility of a route between Swaziland and the new minerals port at Richards Bay.

Geochemical reconnaissance for tin continued and detailed auguring and pitting indicated 75 tons of cassiterite and an equal inferred amount in a recently discovered residual deposit from a stockwork of pegmatites north of Kubta. Approximately one-half ton of tin was mined in 1974 and sent to the Republic of South Africa for processing. There was also some small-scale eluvial tin mining. Stripping operations began at the Pentoyz Mine of the R. D. and B. Tin Mine Ltd. at the end of 1973, where approximately 20 men were employed.

The Havelock Mine of Havelock Asbestos Mines (Swaziland) Ltd. were still encountering the old difficulties of dilution and ground movement, but these were reportedly being controlled. An average of 1,832 laborers were employed in the asbestos mine, earning a total of $3.1 million during 1973. About 72,000 tons of ore is mined each month, from which about 3,000 tons of asbestos fiber is recovered. The chrysotile bodies occur in the center of partly sheared serpentine. The underground extraction is done by both sublevel shrinkage down to the 345 level, and by sublevel caving between the 245 and 315 levels. Four grades of long and medium-length fibers are produced (HVL 3, HVL 4, HVL 5, and 1877) as well as special blends. Besides Swaziland, the only other commercial producers of long-fiber chrysotile (equivalent to Quebec Asbestos Mining Association QAMA Groups 1–3) are the United States (Arizona), Canada, Rhodesia, People's Republic of China and the U.S.S.R. The slight decline in asbestos exports for 1974 was largely due to shipping difficulties at Lourenço Marques. No progress was reported on exploration in the adjacent Lonrho concessions.

The Swaziland Barytes Ltd. mine at Londosi started production in 1974. An average of 55 men were employed at the mine in 1973, earning $38,960 for the year. About 296 tons of barite were exported to the Republic of South Africa in 1974. New markets for drilling muds were being examined and rail freight to Lourenço Marques or to Richards Bay looked favorable.

[1] Swaziland Ministry of Industry, Mines, and Tourism. Annual Report of the Geological Survey and Mines Department For The Year Ended Dec. 31, 1973, p. 14.

[2] U.S. Embassy, Mbabane, Swaziland. State Department Airgram A-9, Jan. 17, 1975, p. 1.

The evaluation of the coal reserves of the Lowveld continued. In 1974, the world energy crisis added impetus to coal exploration, and several applications were processed for prospecting rights over unallocated areas. Swaziland's coalfields occur on the eastern side of the country. Coal seams of varying thickness and quality have been discovered over most of the Lowveld. Minable reserves in excess of 200 million are indicated; resources are estimated in excess of 400 million tons. Most of the coal is low-volatile bituminous, with a smaller quantity of semianthracite or anthracite coal. Considerable potential exists for exports of specially prepared and selected coals from the Lower Coal Seam (Main Seam). Coals from the Upper Seam are poorer in quality and interbedded with shale. The export of large tonnages of such coals is one of the targets of present exploration activities and it was hoped that markets would be found for the export of several million tons per year. The Government reportedly [3] hoped to open three new coal mines by 1980. Swaziland Collieries (a subsidiary of Anglo American Corp.), which operates the Mpaka coal mine, and JCI were reportedly reviewing the possibility of reopening the anthracite prospect at Maloma. Plans were indicated for two high-grade anthracite mines. Combined capacity for both export and use in power generation was estimated at 5 million tons per year with around 2,000 people employed.[4]

One of the results obtained from coal exploration by the Geological Survey in the Lower Coal Member of the Middle Ecca Formation in the Ngomane area has been the good correlation of coal seams over large areas. The main seam of the lower coal member can be correlated over 100 kilometers and can be shown to maintain a constant minable thickness over most of that distance. Where variations in thickness occur, and where the main seam is thick, the associated seams are also thick. This suggested that another thick coal sequence may be developed in the Ngomane area, as indicated by the thickness of individual minor seams. At yearend 1973, three boreholes had been completed in the Ngomane area and two were in progress by early 1974. In October 1974, a mission headed by the Japanese Minister for Industry, Mines, and Tourism visited Swaziland and was expected to conduct a survey into the possibilities of coal mining in the kingdom.[5]

During 1973, known fluorite occurrences of southern Swaziland, south of Mhlosheni and Hluti were restudied. This was followed by a search that indicated more widespread fluorite occurrences than previously known. None of the prospects have proved economic so far.

On April 15, 1974, the Swazi nation through the Tibiyo Taka Ngwane Fund was awarded the mining lease for the kaolin deposits near Sicunusa. All the mining equipment owned by Kaolin (Pty.) Ltd. has been purchased by the Tibiyo Fund. Kaolin production increased and no production problems were experienced following this transference of mine ownership to the Swazi nation. New markets were appearing for crude clay, produced in three grades (white, cream, and pink) for South African industries. The deposits are estimated to be in excess of 300,000 tons, but not all is salable. Up to 300 tons of clay each month was expected to be excavated.

## TOGO [6]

"If 1975 has been declared 'Year of the Farmer' in Togo, certainly 1974 should have been declared 'Year of Phosphate.' " [7] That quotation sums up the situation in Togo's mining industry and economy in 1974. The phosphate industry became the center of action, partly as a result of a fivefold increase in phosphate prices and partly because of its nationalization early in the year.

The price rise boosted Togo's income from phosphate mining by 450% and gave the country its first positive balance of trade. Owing to the nationalization, all of the income was retained, and government revenues rose by a much larger factor. Production of most other mineral commodities also increased, but their effect on the total economic picture was minimal.

[3] Industriade Moçambique (Lourenço Marques). Noticiario. V. 7, No. 5, May 1974, p. 193.
[4] Standard Bank Review (London). Swaziland. January 1974, p. 24.
[5] Standard Bank Review (London). Swaziland. October 1974, p. 20.
[6] Prepared by David G. Willard.
[7] U.S. Embassy, Lome, Togo. State Department Airgram A-38, June 24, 1975, p. 3.

Generally poor results elsewhere in the economy magnified the importance of the gain in mining. Although Togo escaped the worst of the Sahel drought, agricultural production declined, causing a drop in cash crop income and a rise in food imports. World inflation, particularly in fuel costs, meanwhile sharply boosted the bill for imported goods.

Developments in mining moved relatively slowly during the year because investors were cautious in the wake of the phosphate nationalization and generally uncertain business conditions. Construction of the oil refinery at Lome finally began more than 1 year behind schedule, but work had not yet started on either of the other two major mineral-processing projects, the cement and fertilizer plants. However, the Government's profits from phosphate should enable starts to be made on both in 1975. Prospects for offshore petroleum production diminished with the withdrawal of the only two remaining concessionaires.

The outlook for mining in 1975 remained generally favorable, although phosphate earnings had begun to dip as the result of a growing world oversupply. Somewhat lower export revenues and a continuing increase in most import costs are expected to reduce both the trade balance and the Government's budget surplus. The phosphate industry will continue to underpin the economy, however, and will probably provide sufficient profits to support further progress on currently planned investments.

**Government Policies and Programs.**—Nationalization of Compagnie Togolaise des Mines du Benin (CTMB) does not appear to have signaled increasing governmental control of the economy. Policy differences between the company and the Government, along with the phosphate industry's prime importance to the economy, probably made CTMB's situation unique and brought on the governmental action. The successful conclusion of a compensation agreement and the absence of further nationalizations or changes in laws pertaining to business have helped to restore investor confidence in the Government and its policy.[8]

Goals for Togo's third 5-year development plan, covering 1975–80, were announced on the heels of an analysis showing that the second 5-year plan (1970–75) was falling short of its objectives. Below-average agricultural growth (partly caused by drought) and unstable world market and financial conditions were found primarily to blame for the shortfall; accordingly, the new plan placed heavy emphasis on agricultural development and economic independence. Of particular concern to investors were policy declarations calling for reduced dependence on outside financing, reduction of the scale of industrial projects, the substitution of labor for capital, and a priority status for agricultural development.[9]

Slow improvements continued to be made in the country's physical facilities. With help from the West German-European Development Fund, the port of Lome was being expanded to allow off-loading of petroleum products and other cargo. The $22 million project was scheduled for completion in 1977. Improvements in the road and rail systems were in the planning stage.[10] Also in the planning stage were additions to the country's electric power capacity with the help of a $234,000 United Nation's grant to the Communauté Electrique du Benin (CEB) for studies of anticipated power requirements in Togo and Dahomey and the updating of a feasibility plan for the Mono River hydroelectric project. Plans already prepared called for a special power distribution system to serve the proposed cement plant of Ciments de l'Afrique de l'Ouest (CIMAO).[11]

## PRODUCTION AND TRADE

A relatively small increase in physical output accompanied by drastic increases in prices resulted in a massive growth in the value of Togo's mineral production in 1974. On the basis of incomplete figures, it can be estimated that the total value increased more than 300%, from about $30 million in 1973 to over $130 million in 1974. These figures exclude all output of building materials, the values of which are not reported.

Phosphate production reached its capacity level of 2.5 million tons in 1974, as

[8] U.S. Embassy, Lome, Togo. State Department Telegram 1764, August 1975, p. 1.
[9] U.S. Embassy, Lome, Togo. State Department Airgram A–34, June 11, 1974. Joint Publications Research Service. Translations on Africa No. 415, JPRS L/4989, Aug. 1, 1974, p. 29.
[10] U.S. Embassy, Lome, Togo. State Department Airgram, A–38, June 24, 1975, p. 7.
[11] U.S. Embassy. Lome, Togo. State Department Airgrams A–66, Dec. 10, 1974, and A–43, July 5, 1974, p. 5.

the adjustment accompanying nationalization was made without serious disruption. A 13% increase in output coupled with a fourfold increase in the average unit value skyrocketed the total value received from phosphate by over 350%, from $28 million in 1973 to $130 million in 1974. That gain plus the assumption of complete ownership boosted government revenue from phosphate by an even larger factor and brought the industry to its present dominant position in the economy.

Higher output levels were recorded for most other mineral products, but their contributions to the country's income were minor in comparison with that of the phosphate industry. Government investments in highways and industrial and tourist facilities increased the demand for construction materials despite a downturn in private construction activity. Output of the cement clinker crushing plant increased 12% to its capacity of nearly 128,000 tons, and production levels of brick and ceramic tile remained high. The only recorded mineral industry to experience a poor year was the marble industry, output of which declined 29% from the previous year's level.

Statistics on Togo's mineral production in 1973 and 1974 are included in table 1.

Detailed trade data for Togo were not available at the time this chapter was written. The latest trade statistics available are those for 1972, and are contained in the 1973 Minerals Yearbook chapter.

## COMMODITY REVIEW

**Cement.**—The CIMAO consortium gained an additional partner in 1974, the Government of Ghana, which became the third west African member along with the Governments of Togo and the Ivory Coast. A need for additional sources of financing had delayed the start of construction on the cement plant, but tenders for some of the equipment were expected to be issued within the next year. The plant is designed for an initial capacity of 1.2 million tons per year, increasing to an ultimate capacity of 1.8 million tons per year, and will require a regional market. Its raw material source is the extensive limestone deposit recently discovered at Sikakondji.[12]

Slackening regional demand for the output of Togo's clinker-crushing plant during the fall allowed the Government to cancel a ban on exports of cement that had been imposed in September 1973. Reduced construction activity resulting from the oil shortage's impact on business was responsible for the drop in cement demand. However, an upsurge in construction caused the ban to be reimposed during the following summer.[13]

**Phosphate.**—A tense political situation was resolved by the complete nationalization of CTMB on February 4, 1974. CTMB owned the phosphate mine that has become Togo's most important industry. Arrangements for the takeover and negotiations for compensation of the previous owners proceeded reasonably smoothly and rapidly. A technical agreement had previously been signed with a Parisian company of phosphate specialists for the provision of technical, maintenance, purchasing, and marketing assistance. Production rose to capacity, and a compensation agreement that reportedly satisfied all parties was reached by midsummer. Shipments to customers, including those who were former owners, were not interrupted.[14]

Reasons for the takeover apparently centered on the marketing policies of the former owners of CTMB who, since they included several major phosphate consumers, had been unwilling to raise their prices in line with the phosphate market's trend.[15] The company's name, Compagnie Togolaise des Mines du Benin, remained unchanged, but its suffix became "Société Nationale" instead of "Société Anonyme Mixte" and the contraction was altered to COTOMIB. A new board of directors consisting entirely of government agency heads was appointed by the President.[16]

Construction work was completed on the new mine at Kpogame, which started producing in September 1973. However, construction of the Société Togolaise des Engrais (STEN) fertilizer plant was de-

[12] The Economist Intelligence Unit. Quarterly Economic Review. Ivory Coast, Togo, Dahomey, Niger, Upper Volta. No. 3, 1975, pp. 11–12, and Annual Supplement 1975, p. 17.

[13] U.S. Embassy, Lome, Togo. State Department Airgram A–43, Aug. 19, 1975, 1 p.

[14] European Chemical News. Togo Takes Over Phosphate Rock Mines. V. 25, No. 622, Feb. 8, 1974, p. 4.

Joint Publications Research Service. Agreement on Nationalization of Firm. Translations on Africa No. 1494, JPRS 62533, July 22, 1974, p. 34.

[15] Joint Publications Research Service. Commentary on Phosphate Company Nationalization. Translations on Africa No. 1460, JPRS 61752, April 15, 1974, pp. 25–26.

[16] U.S. Embassy, Lome, Togo. State Department Telegram 1407, July 1974, 2 pp.

layed owing to deteriorating market conditions. Although the phosphate selling price was maintained at $75 per ton, export sales volume fell below the expected level and stockpiles increased. Production cutbacks were likely if the market failed to improve.[17]

**Petroleum.**—Construction work on Togo's first oil refinery began during the summer of 1974, more than 1 year after the foundation stone was laid in April 1973. Preparatory work comprising a construction camp, internal roads, and storage-tank foundations occupied the remainder of the year. Laying pipelines from the new pier in Lome's port was slated for early 1975, and some of the major plant equipment was beginning to arrive. Owing to the delay, startup of the refinery is not now expected until the fall of 1976.[18] Crude oil will be supplied from both Nigeria and Gabon, in each case as part of a barter agreement for Togolese phosphate.[19] Togo currently depends entirely on imports for its petroleum supply, the cost of which rose from $3.7 million to $10.5 million between 1973 and 1974. The refinery could provide a considerable savings in foreign exchange as long as there continues to be a sufficient export outlet for its surplus.[20]

Prospects of finding crude petroleum off Togo's coast grew dimmer as the only two concessionaires ceased all activity and relinquished their exploration rights. Ashland Oil Co., operator for Frontier Petroleum Corp. and Amerada Oil Co., had previously drilled two unsuccessful wells, the last in 1971. After analyzing the results, the combine announced its withdrawal in late 1973. Shell Togorex had received a concession in January 1972 that consisted of an area previously relinquished by Frontier and a new deepwater area. The company undertook no drilling and announced its intention to withdraw in early 1974. Possible interest in a concession was shown by CONOCO.[21]

**Other Minerals.**—Exploration for other mineral resources continued through the aid of various public agencies, but no new discoveries were announced. The French BRGM, in conjunction with the Fonds d'Aide et de Cooperation (FAC) investigated copper and chromite deposits in the Lama Kara region. The UNDP assisted the Service des Mines et de la Geologie Togolaise in the establishment of a geochemical laboratory and the organization of a reconnaissance geochemical survey.[22]

## UPPER VOLTA[23]

The mineral industry of Upper Volta contributed very little to the estimated GDP of $313.2 million[24] for 1974. Most activity was in the form of agreements signed, development plans, and foreign aid. Inflation of 20% to 30% was a problem, and the value of petroleum imports saw an increase of 40%. The energy crisis brought about an additional $2 million for higher priced petroleum imports in 1974. The chronic trade deficit persisted. Even so, the outlook was optimistic toward the end of the year as the development agreement for the Tambao manganese project was signed and financing for the necessary infrastructure was being realized.

The second 5-year plan (1972–76) relied on foreign aid for about 80% of total project financing. Total investment during this period was set at approximately $270 million. Some of the plan's objectives have been revised as a result of the drought. New project focus is on the processing of primary products. Government receipts, accounts, and expenditures for 1974 were set at $56 million, up 15% from those of 1973. France accorded a grant of $3.26 million as substitute for taxes lost because of drought. Despite the sizable current account deficit, the country had a slight balance of payments surplus. This is due mainly to the inflow of for-

[17] Mining Magazine. Major New Projects and Expansion Programmes. V. 131, No. 3, September 1974, p. 217.
U.S. Embassy, Lome, Togo. State Department Airgram, A–38, June 24, 1975, p. 4.
[18] Joint Publications Research Service. Petroleum Refinery. Translations on Africa No. 416, JPRS L/4996, Aug. 8, 1974, p. 29.
[19] U.S. Embassy, Lome, Togo. State Department Telegram 684, March 1975, 2 pp.
[20] U.S. Embassy, Lome, Togo. State Department Airgram, A–38, June 24, 1975, p. 5.
[21] U.S. Embassy, Lome, Togo. State Department Airgram A–24, April 18, 1974, 1 p.
[22] Mining Journal. Togo. Mining Annual Review, June 1974, p. 373, and June 1975, p. 443.
[23] Prepared by Janice L. W. Jolly.
[24] Where necessary, values have been converted from Communauté Financière Africaine Francs (CFAF) to U.S. dollars at the rate of CFAF222=US$1.00.

eign aid ($70 million in 1974) and remittances from Upper Voltans working in neighboring countries (about $30 million per year.)[25] The national debt represents 7.5% of the budget.

More than 40% of foreign aid has come from France and 30% from the EEC. Federal Republic of Germany, People's Republic of China, Canada, Netherlands, Switzerland, Zaire, Libya, and the United States have all contributed to the subsidies and loans. Contributions on the part of international organizations such as the International Bank for Reconstruction and Development (IBRD), the African Development Bank (ADB), UNDP, the European Development Fund (EDF), and the Aid and Cooperation Fund (FAC) have also been made. Part of the aid granted was for the struggle against drought. Economic development efforts have been hampered by the country's landlocked position, the drought, and increased prices for oil and manufactured goods.

In November 1974, the Banque Internationale des Voltas (BIV) replaced the Banque International d'Afrique Occidentale. The Government holds 51% of the BIV and the First National Bank of New York holds 24%. Upper Volta is an active member of several African organizations for economic coordination, trade, and development, including the West African Economic Community (CEAO) based in Upper Volta, and the Organization Commune Africaine Malgache et Mauricienne (OCAM). The Liptako-Gourma agreement includes Upper Volta, Mali, and Niger.

The Liptako-Gourma development program financing began in 1974. Economic development for the region covers four areas: Highway and rail infrastructure, mineral prospecting, agriculture, and geophysical research. Photographs taken during the mission of the U.S. Skylab 3 were to be used for detecting resources of the Liptako-Gourma area.[26] In 1974, work will begin on enlarging and asphalting 815 kilometers of roads. Another keystone to opening up the region is the construction of the Ansongo (Mali)-Ouagadougou extension of the Abidjan-Niger railway line. The railroad, 705 kilometers long, and costing about $90 million, will cross the mining region of Tambao, and will have a line going to Niamey (Niger) from Dori. The cost of the railroad from Tambao to Ouagadougou was now estimated to be about $81 million, including equipment. A conference for the coordination of financing the Tambao projects was held in December between the Government and representatives of Canada, France, Japan, West Germany, ADB, World Bank, EDF, Caisse Centrale de Cooperation Economique (CCE) and the Banque Europeene d' Investissements (BEI). The PRC also reportedly made a $25 million credit offer for construction of the railroad.[27] Upper Volta requested a loan of $450,000 from the World Bank for financing the study for the route extending from Dori to Djibo.

Electrical power is also a prime development target. A diesel power station, composed of two units generating 1,500 kilowatts each, was scheduled to be put into service in May 1975 at Ouagodougou. Four other projects were under discussion for Bobo-Dioulasso (1,500 kilowatts scheduled for May 1976), and for Kou River, Gaoua, Kaya, Tenkodogo, and FadaN'Gourma (scheduled for completion before 1976). Construction of a dam with a 60,000-kilowatt-hour generating capacity on the Black Volta at Noumbiel is planned for the Gaoua area.[28] Total installed electrical capacity at the end of 1973 was 16.7 megawatts. The principal operator of electric energy was the State Société Voltaique d' electricite (VOLTELEC).[29]

Total foreign investment at the end of 1973 was estimated at $13 million to $17 million, of which about 60% was French and/or European. The Voltans have a liberal investment code, which grants tax and customs exemptions, tariff protection, eased foreign currency restrictions, and guaranteed arbitration.

The General Office for the Tambao Projects was set up in March 1974, to coordinate various studies and projects. Its purpose was to promote all operations and carry out the construction of the Ouagadougou-Tambao railroad, the acquisition of rolling stock, the working of

[25] U.S. Embassy, Ouagadougou, Department of State Airgram A-004, Jan. 23, 1975, 10 pp.
[26] La Semaine (Brazzaville). (Liptako-Gourma countries Said to Have Mineral Wealth). Feb. 3, 1974, p. 5.
[27] Bulletin du Bureau de Recherches Geologiques et Minieres (Paris). Geologie Appliquee chronique des mines. V. 42, No. 420, p. 432.
[28] U.S. Embassy, Ouagadougou. Department of State Airgram A-21, April 22, 1975, p. 1.
[29] Industries et Travaux D'Outremer (Paris). Upper Volta. V. 22, No. 253, Dec. 1974, p. 1105.

the Tambao mine and related projects, the managing of the Tin Hrassau cement works located near Tambao, the installation of equipment for supplying water and energy to the Tambao complex and Tin Hrassau, and finally, the necessary improvements to the port where the mineral will be exported. In addition to the General Office, the Direction des Mines et de Geologie continues to be involved in prospecting for diamonds and kaolin. The UNDP, BRGM and the Société Generale d' Exploitation et de recherche Minière (SOGEREM) were also undertaking mineral studies. Federal Republic of Germany had donated geophysical equipment to the Direction des Mines et de Geologie in June 1974.

SOGEREM, a subsidiary of PUK, was evaluating the white bauxite deposits of the Kaya-Kongoussi area. A previous study by BRGM indicated 3 million to 5 million tons. In another region, extending from Dano to Tougan, the existence of bauxite has also been confirmed, but further studies were needed in both areas. A French loan was to be used for the reconnaissance studies.

BRGM was studying copper, antimony, and phosphate deposits. The lead occurrence at Gan, 30 kilometers northeast of Tougan, and the antimony at Mafoulou, 20 kilometers southeast of Kongoussi, were being studied to determine their extent and the economic feasibility of mining them. The phosphates at Anly contain between 2.7 million and 4 million tons of 27% to 31% $P_2O_5$, as determined in 1973. Other large phosphate strata were also noted in the Kodjari-Tansanga District. Followup studies were being inaugurated. Copper-gold reserves at the Dienemera deposit were estimated at 40 million tons of ore containing 0.8% copper and 2 grams gold per ton and, reportedly, an additional 3.5 million tons of 2% copper.

Systematic prospecting for diamonds was initiated by the Direction des Mines et de Geologie based on the original discovery of 19 small diamonds in the Comoe Basin in an attempt to pinpoint the origin. UNDP was assisting the exploration of 70,000 square kilometers north of Ouagadougou. New possibilities were being speculated for the vanadium-bearing iron ores of the Tin Edia deposit near Oursi, where reserves were estimated at 50 million tons of 40% to 45% Fe, 9% to 14% Ti, 2.2% $SiO_2$, and 1% $V_2O_5$.

The concession for exploiting the Tiara marble deposits, located 32 kilometers from Bobo-Dioulasso, was given to Compagnie Voltaique d'Exploitation Minière (COVEMI). Other marble deposits are known at Kiounkogo (1,350,000 cubic meters), Kioukar-Tingo (9 million cubic meters) and Samandeni (6 million cubic meters). The Tin Hrassan limestone deposit on which the cement project is to be based contains 56 million tons of rock with 46% CaO and 3% MgO. A cement factory to produce 70,000 to 133,000 tons per year was planned.

An agreement was signed in early 1975 for mining the Tambao manganese deposit, creating a new company called the "New Society," in which Upper Volta will have 51% and an association of international interests will have 49%. This is distributed as follows: The Ferric Alloys Corporation of Japan, 30%; Exploration and Bergbau Co. of West Germany, 9%; Union Carbide Co. of the United States, 7%; and Société Minière Manganese of France, 3%. The agreement provides for a buy-back arrangement of the production in proportion to the shares each company owns in the mining venture. The ore would thus be sold to Japan (383,000 tons), West Germany (115,000 tons), the United States (89,000 tons), and France (38,000 tons). The new development company was to be capitalized at $8 to $10 million, indicating development costs of about $30 million. Production was anticipated by 1980. The mine was expected to have a life of at least 25 years.

# The Mineral Industry of Other Countries of the Near East

By Daniel C. Adkins,[1] and Fay B. Dillard,[2] and Bernadette Michalski [2]

## CONTENTS



## BAHRAIN [3]

During 1974, the Bahrain Government reported revenue receipts approaching $133 million. Of this total, $85 million was realized from the petroleum industry. More than a third of total petroleum revenues or $31 million was derived from the Bahrain Government's 50% interest in the Saudi Arabian Abu Safah Field. Domestic production is limited to the Awali Field, which averaged a little more than 67,000 barrels per day. Bahrain Petroleum Co., Ltd. (Bapco) operated the Awali Field and the 250,000-barrel-per-day refinery at Awali. Refinery daily throughput in 1974 averaged 245,000 barrels of crude and 5,400 barrels of blend stocks. More than 70% of the refinery throughput was Saudi Arabian crude delivered via the Dharan pipeline. The fee levied on Saudi Arabian crude processed at the Awali refinery and the tax and royalty payments on domestic production accounted for most of the remaining petroleum-derived revenues.

Bapco produced nonassociated gas from the Khuff Zone and from the Arab Zone. Total natural gas production averaged 274 million cubic feet per day, compared with 227 million in 1973. Higher gas production resulted from field facility modification and installation of new units. The largest single consumer of natural gas was Aluminium Bahrain, Ltd. (Alba), which utilized 112 million cubic feet per day to power its aluminum smelter.

Seventy-seven million cubic feet of natural gas was injected daily into the oil reservoir for pressure maintenance, 57 million cubic feet was consumed daily at the Bapco refinery, and 24 million cubic feet was delivered daily to the Government power station.

In late 1974, the Bahrain Government acquired a 60% participation in Bapco, formerly a joint venture of Texaco, Inc. and Standard Oil Co. of California. The 60% participation was retroactive to January 1974. The Bahrain Government also acquired a 25% participation retroactively effective for the 1973 calendar year. The participation agreement includes the Government's offer to permit the company to buy back the equity crude at a rate be-

[1] Physical scientist, Division of Petroleum and Natural Gas.
[2] Mineral specialist, Division of Petroleum and Natural Gas.
[3] Prepared by Bernadette Michalski.

tween 93% and 95% of the posted price. The participation agreement includes Bapco's oil and gas production operations but excludes refinery operations.

## Table 1.—Other Near East Areas: Production of mineral commodities

| Area, commodity, and unit of measure | 1972 | 1973 | 1974 p |
|---|---|---|---|
| **BAHRAIN** [1] | | | |
| Aluminum, primary smelter ---- metric tons | 62,700 | 102,600 | 118,000 |
| Gas, natural: | | | |
| Gross production ---- million cubic feet | 63,419 | 82,855 | 100,010 |
| Marketed production [2] ---- do | e 40,000 | 56,575 | 68,255 |
| Petroleum: | | | |
| Crude ---- thousand 42-gallon barrels | 25,508 | 24,948 | 24,597 |
| Refinery products: | | | |
| Gasoline ---- do | 7,335 | 8,607 | 9,742 |
| Jet fuel ---- do | 15,033 | 11,839 | 8,658 |
| Kerosine ---- do | 950 | 1,529 | 2,334 |
| Distillate fuel oil ---- do | 20,400 | 19,704 | 19,001 |
| Residual fuel oil ---- do | 33,453 | 35,872 | 37,877 |
| Lubricants ---- do | -- | 745 | 666 |
| Other ---- do | 6,390 | 8,194 | 10,449 |
| Refinery fuel and losses ---- do | 3,678 | 4,263 | 2,669 |
| Total ---- do | 87,239 | 90,753 | 91,396 |
| **JORDAN** | | | |
| Cement, hydraulic ---- thousand metric tons | 662 | 617 | 596 |
| Clays ---- do | 3 | 5 | 10 |
| Fertilizer materials, crude phosphate rock ---- do | r 694 | 1,106 | 1,595 |
| Gypsum ---- do | 30 | 30 | 30 |
| Iron and steel semimanufactures ---- do | 30 | 28 | 25 |
| Lime ---- do | 2 | 3 | 3 |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels | 1,006 | 947 | 1,202 |
| Jet fuel ---- do | 334 | 361 | 490 |
| Kerosine ---- do | 756 | 873 | 875 |
| Distillate fuel oil ---- do | 1,071 | 1,259 | 1,437 |
| Residual fuel oil ---- do | 1,089 | 1,274 | 1,283 |
| Other: | | | |
| Liquefied petroleum gas ---- do | 201 | 199 | 239 |
| Asphalt ---- do | 172 | 244 | 239 |
| Unspecified ---- do | 875 | 833 | 1,032 |
| Refinery fuel and losses ---- do | 440 | 267 | 453 |
| Total ---- do | 5,944 | 6,257 | 7,250 |
| Salt ---- thousand metric tons | r 20 | 16 | 15 |
| Stone: | | | |
| Limestone ---- do | 2,500 | 3,000 | 3,000 |
| Marble ---- thousand square meters | 75 | 100 | 100 |
| **LEBANON** [1] | | | |
| Cement, hydraulic ---- thousand metric tons | r 1,686 | 1,659 | 1,744 |
| Gypsum ---- do | r e 20 | 10 | 13 |
| Iron and steel semimanufactures [e] ---- do | 300 | 300 | 350 |
| Lime ---- do | e 120 | 152 | 177 |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels | 3,809 | 4,251 | 4,904 |
| Jet fuel ---- do | 1,051 | 1,610 | 1,663 |
| Kerosine ---- do | 178 | 178 | 172 |
| Distillate fuel oil ---- do | 2,493 | 2,716 | 3,179 |
| Residual fuel oil ---- do | 7,215 | 6,367 | 6,079 |
| Other ---- do | 424 | 704 | 875 |
| Refinery fuel and losses ---- do | 687 | 1,416 | 849 |
| Total ---- do | 15,857 | 17,242 | 17,721 |
| Salt ---- thousand metric tons | r e 35 | 36 | 35 |
| **OMAN** [1] | | | |
| Gas, natural: | | | |
| Gross production [e] ---- million cubic feet | r 100,000 | r 105,000 | 105,000 |
| Marketed production [e] ---- do | 1,500 | 1,500 | 1,500 |
| Petroleum, crude ---- thousand 42-gallon barrels | 103,131 | 106,926 | 106,046 |

See footnotes at end of table.

## Table 1.—Other Near East Areas: Production of mineral commodities—Continued

| Area, commodity, and unit of measure | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN** | | | |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels | 3,400 | 3,285 | 3,767 |
| Jet fuel ---- do | 3,400 | 2,525 | 1,928 |
| Kerosine ---- do | 1,050 | 1,106 | 1,081 |
| Distillate fuel oil ---- do | 3,100 | 3,767 | 4,368 |
| Residual fuel oil ---- do | 14,500 | 12,185 | 8,135 |
| Other ---- do | 160 | 21 | 30 |
| Refinery fuel and losses ---- do | 1,149 | 1,676 | 596 |
| Total ---- do | 26,759 | 24,565 | 19,905 |
| Salt ---- thousand metric tons | 75 | [r e] 75 | [e] 75 |
| **QATAR [1]** | | | |
| Cement, hydraulic [e] ---- do | 100 | 100 | 100 |
| Gas, natural: | | | |
| Gross production ---- million cubic feet | [e] 180,000 | 246,185 | [e] 225,000 |
| Marketed production ---- do | [e] 52,000 | 55,828 | [e] 60,000 |
| Petroleum: | | | |
| Crude ---- thousand 42-gallon barrels | 176,545 | 208,152 | 189,348 |
| Refinery products: | | | |
| Gasoline ---- do | 69 | 69 | 54 |
| Kerosine ---- do | 37 | 36 | 30 |
| Distillate fuel oil ---- do | 60 | 73 | 43 |
| Residual fuel oil ---- do | 72 | 36 | 69 |
| Other ---- do | -- | 23 | -- |
| Refinery fuel and losses ---- do | 18 | 19 | 21 |
| Total ---- do | 256 | 256 | 217 |
| **SYRIAN ARAB REPUBLIC [1]** | | | |
| Cement, hydraulic ---- thousand metric tons | 1,004 | 848 | 946 |
| Fertilizer materials, crude phosphate rock ---- do | 112 | 150 | 500 |
| Gas, natural: | | | |
| Gross production [e] ---- million cubic feet | 40,000 | 37,000 | 40,000 |
| Marketed production [e] ---- do | 8,000 | 7,000 | 8,000 |
| Gypsum [e] ---- thousand metric tons | 15 | 15 | 15 |
| Petroleum: | | | |
| Crude ---- thousand 42-gallon barrels | 45,209 | 38,170 | 45,352 |
| Refinery products: | | | |
| Gasoline ---- do | 2,448 | 2,542 | 2,406 |
| Kerosine and jet fuel ---- do | 2,348 | 2,046 | 1,604 |
| Distillate fuel oil ---- do | 4,469 | 4,334 | 3,857 |
| Residual fuel oil ---- do | 4,928 | 4,083 | 4,056 |
| Other ---- do | 96 | 664 | 741 |
| Refinery fuel and losses ---- do | 1,061 | 1,094 | 1,013 |
| Total ---- do | 16,220 | 14,763 | 13,677 |
| Salt ---- thousand metric tons | 50 | 35 | [e] 35 |
| Sand, glass [e] ---- do | 15 | 15 | 15 |
| **UNITED ARAB EMIRATES [1 2]** | | | |
| Abu Dhabi: | | | |
| Gas, natural: | | | |
| Gross production ---- million cubic feet | 412,000 | 520,000 | 570,000 |
| Marketed production ---- do | 45,000 | 55,000 | 65,000 |
| Petroleum, crude ---- thousand 42-gallon barrels | 384,190 | 479,192 | 508,544 |
| Ajman: Marble [e] ---- square meters | 13,000 | 13,000 | 26,000 |
| Dubai: | | | |
| Gas, natural: | | | |
| Gross production [e] ---- million cubic feet | 44,000 | 63,000 | 69,000 |
| Marketed production [e] ---- do | 12,000 | 17,000 | 19,000 |
| Petroleum, crude ---- thousand 42-gallon barrels | 55,942 | 80,207 | 88,148 |
| Sharjah: Petroleum, crude ---- do | -- | -- | 15,997 |
| **YEMEN ARAB REPUBLIC [1]** | | | |
| Cement ---- thousand metric tons | -- | 12 | 36 |
| Salt ---- do | [r] 1 | ([4]) | -- |

[e] Estimate. [p] Preliminary. [r] Revised.

[1] In addition to the commodities listed, crude construction materials such as common clays, stone, and sand and gravel presumably are produced, but output is not recorded quantitatively and general information is inadequate as a basis for formulation of estimates of output levels.

[2] Excluding gas used for gas lift.

[3] In addition to the emirates listed (Abu Dhabi, Ajman, Dubai, and Sharjah), there are three others: Fujairah, Ras al-Khaimah, and Umm al-Qaiwain; these record no mineral production but presumably produce small quantities of crude construction materials.

[4] Revised to none.

Muharraq Island, Bahrain, has been selected as the site for the Organization of Arab Petroleum Exporting Countries (OAPEC) shipbuilding and repair yard. The cost of the project, financed by Bahrain, Libya, Saudi Arabia, Kuwait, Iraq, Qatar, and the United Arab Emirates, has been revised upward to $186 million. Initial plans included facilities for repair of 500,000 deadweight ton and 1-million deadweight ton tankers; however, these plans may be revised in view of the changing trend in shipping patterns. The contract for dredging operations was awarded to Falcon Dredging Co., a joint venture of Costain Civil Engineering Ltd. (United Kingdom) and Blankevoort (Netherlands). Dredging activity involves clearing 450,000 square meters to a water depth of 12 meters. The contract for the design and civil engineering was awarded to Sir Alexander Gibb and Partners (United Kingdom) and Profabril, a subsidiary of Companhia Union Fabril (Portugal). The management contract was awarded to Lisnave (Portugal). Drydock services should be available by mid-1977.

Primary aluminum was produced at the Alba smelter near Askar. The smelter operated at capacity, producing 118,000 tons of aluminum ingot in 1974. Imported alumina from Aluminum Co. of America (Alcoa) operations at Kwinana, Australia, was the source of raw material. Power was supplied by the 300-megawatt-capacity Alba powerstation, which is fueled by natural gas from the Khuff formation. Aluminium Bahrain, Ltd. sells its production to six shareholders in quantities proportionate to their equity in the company. Almost all production is exported in ingot form. Plans for an aluminum extrusion plant to service local needs are under consideration. Bahrain's production of mineral commodities is reported in table 1, while trade in crude petroleum and petroleum products is reported in table 2.

**Table 2.—Bahrain: Foreign trade of crude petroleum and petroleum refinery products**
(Thousand 42-gallon barrels)

| Commodity | 1972 | 1973 | 1974 |
|---|---|---|---|
| EXPORTS | | | |
| Crude oil | 709 | -- | 2,831 |
| Petroleum refinery products: | | | |
| Gasoline | 7,159 | 8,311 | 9,366 |
| Jet fuel | e 14,900 | 9,962 | 7,674 |
| Kerosine | e 920 | 2,107 | 2,320 |
| Distillate fuel oil | e 20,000 | 19,254 | 663 |
| Residual fuel oil | e 28,000 | 9,666 | 37,152 |
| Lubricants | e 30 | 718 | -- |
| Other, including naphtha | e 6,200 | r 11,051 | 10,373 |
| Total | e 77,209 | 61,069 | 67,548 |
| BUNKER LOADINGS | | | |
| Petroleum refinery products: | | | |
| Distillate fuel oil | e 500 | 636 | NA |
| Residual fuel oil | e 5,300 | 6,180 | NA |
| Total | e 5,800 | 6,816 | NA |
| IMPORTS | | | |
| Crude petroleum | 60,309 | 64,744 | 64,521 |
| Petroleum refinery products: | | | |
| Gasoline and naphtha | e 1,500 | -- | -- |
| Lubricants | e 69 | -- | 3 |
| Total | 1,569 | -- | 3 |

e Estimate. r Revised. NA Not available.

## JORDAN [4]

The economy continued to expand during 1974 with the gross national product (GNP) at about $1 billion [5] in current dollars, a real increase of 7% over that of 1973. The mineral industry contributed about 15% of this total. The principal mineral industries are phosphate rock mining and beneficiating, cement manufacturing, refining imported crude petroleum, and metal manufacturing from crude imported forms. Feasibility studies are planned on extracting potash from the Dead Sea. Production of Jordanian mineral commodities is reported in table 1.

Total exports were valued at $126 million, almost three times the 1973 level, with nearly half of this total accounted for by raw phosphates, Jordan's chief export. During 1974, cement exports rose substantially.

Imports in 1974 were valued at $498 million. Although the trade deficit totaled $372 million, foreign exchange reserves increased by 10% to $377 million, making Jordan's balance of payments favorable by $43 million in 1974.

Phosphate production reached approximately 1.6 million tons in 1974, a 44% increase over the 1973 figure. Confirmed phosphate rock reserves reached approximately 300 million tons, while potential reserves were estimated at 1,000 million tons. With the planned completion in 1975 of a railway extension from the El Hasa mines to Aquaba, along with a third phosphate loading berth, and the reopening of the Suez Canal in 1975, Jordan will have the means to supply new potential markets. The Jordan Phosphate Mines Co. hoped to triple its output of phosphate rock by 1976; most of the expansion was scheduled to come from the high-grade phosphate mined at El Hasa in Southern Jordan. Also plans were being made for the addition of two mill sites either at the existing mines at El Hasā, or at a new site further south.

Plans were nearing completion at year-end 1974 for the construction of a chemical fertilizer manufacturing complex, the Jordan Fertilizer Industry Co. The Agrico Chemical Co., a subsidiary of the Tulsa, Okla.-based Williams Companies, will have 25% of this joint venture. Construction by Agrico on this project was scheduled to begin during mid-1975, to be completed in 1978 at an estimated cost of $180 million. Agrico will operate the plant for 3 years, after which all the plant's personnel will be Jordanian nationals. The plant will produce phosphoric acid (1,000 tons per day), triple superphosphate, monobasic ammonium phosphate, and dibasic ammonium phosphate. Capacity is expected to be 600,000 tons per year. This new export venture reportedly will be the largest single private investment by a U.S. firm in Jordan.

The proved manganese reserves in southern Jordan have been reported at 1.5 million tons, with 38% manganese content. The Nation's total reserves are estimated at 5 million tons. In addition to manganese mining, Jordan is also considering copper mining. Proved copper ore reserves amount to 60 million tons, and the total probable reserves are about 150 million tons.

Exploration activities by Desco Investments, Ltd. (Canada) for petroleum did not result in any commercial discoveries. However, Jordan invited other firms to enter exploration activities. No petroleum is produced in Jordan, and most domestic requirements are satisfied by the Zerqa' refinery processing of Saudi Arabian crude delivered via the Trans-Arabian Pipeline (TAPline). During 1974 a price dispute between TAPline and Jordan was not resolved. In spite of the unsettled price, an average of 16,000 barrels per day was refined at Zerqa'. The state-owned Jordan Petroleum Refinery Co. invited bids in mid-1974 to expand its refinery installations at Zerqa' to increase capacity to 2.9 million tons per year and to add hydrotreating and aromatics extraction units. The project includes construction of a new bulk storage station in Amman and new storage tanks and ancillary facilities at Zerqa'. Two product pipelines will link the refinery to the products terminal in Amman.

[4] Prepared by Fay B. Dillard.

[5] Where necessary, values have been converted from Jordanian dinars (JD) to U.S. dollars at the rate of JD1=US$3.18.

## Table 3.—Jordan: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum, unwrought and semimanufactures | 398 | 290 | Syria 187; Lebanon 98. |
| Copper: | | | |
| Matte | 517 | 909 | Lebanon 809. |
| Semimanufactures | -- | 37 | All to Lebanon. |
| Gold, unwrought or semimanufactured troy ounces | 643 | -- | |
| Iron and steel: | | | |
| Scrap | 465 | 9,735 | Lebanon 8,979. |
| Semimanufactures | r 144 | 174 | Saudi Arabia 104; Muscat 51. |
| Lead oxides | 156 | -- | |
| NONMETALS | | | |
| Cement | 298,821 | 196,305 | Syria 130,812; Saudi Arabia 63,408. |
| Clay products, refractory | -- | 278 | All to Iraq. |
| Fertilizer materials, crude phosphate | 952,371 | 1,088,575 | NA. |
| Salt | -- | 1,288 | Syria 1,285. |
| Stone, sand and gravel: | | | |
| Dimension stone, crude and partly worked: | | | |
| Calcareous | 5,289 | 7,795 | Syria 4,455; Lebanon 2,003. |
| Granite | 1,633 | 1,241 | Lebanon 657; Kuwait 345; Syria 165. |
| Crushed stone and gravel | 1,532 | 2,614 | Lebanon 2,067; Syria 481. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen | -- | 15,246 | Syria 8,120; Saudi Arabia 4,862; Yemen 1,993. |
| Gas, hydrocarbon, natural | -- | 77 | Saudi Arabia 40; Syria 37. |
| Petroleum, refinery products: | | | |
| Gasoline thousand 42-gallon barrels | -- | 4 | All to Syria. |
| Residual fuel oil do | -- | 154 | Do. |
| Other, n.e.s do | -- | 4 | Mainly to Syria. |

r Revised. NA Not available.

## Table 4.—Jordan: Imports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum including alloys, semimanufactures | r 695 | 929 | Lebanon 604; People's Republic of China 133. |
| Copper including alloys, all forms | 343 | 121 | India 51; United Kingdom 28; Greece 16. |
| Iron and steel: | | | |
| Scrap | 804 | 748 | Kuwait 667. |
| Pig iron, ferroalloys, and similar materials | 5,000 | 26,223 | Republic of South Africa 21,225; U.S.S.R. 4,998. |
| Steel, primary forms | r 22,412 | 326 | Belgium 325. |
| Semimanufactures | r 47,947 | 49,077 | Belgium 9,495; Czechoslovakia 7,540; Japan 7,321. |
| Lead: | | | |
| Oxides | 425 | 76 | West Germany 69. |
| Metal including alloys | 3,030 | 2,338 | Kuwait 1,242; Saudi Arabia 1,025. |
| Titanium oxides | 138 | 75 | United Kingdom 36; Italy 22; Denmark 17. |
| Other: | | | |
| Base metals including alloys, unwrought, n.e.s | 66 | 50 | All from Turkey. |
| NONMETALS | | | |
| Abrasives, natural, grinding and polishing wheels and stones | -- | 189 | Belgium 151; Italy 23. |
| Cement | 4,838 | 8,412 | Lebanon 6,690; Iraq 1,127. |
| Chalk | 440 | -- | |
| Clays and clay products: | | | |
| Crude clays | 526 | 359 | Italy 149; Kuwait 140; People's Republic of China 39. |
| Products: | | | |
| Refractory | 1,642 | 978 | Belgium 563; West Germany 357. |
| Nonrefractory | 864 | 1,727 | Czechoslovakia 491; Italy 394; Lebanon 274. |
| Fertilizer materials, crude and manufactured: | | | |
| Nitrogenous | 3,000 | 6,125 | West Germany 2,587; Austria 870; France 796. |
| Phosphatic | -- | 3,504 | Lebanon 1,848; West Germany 813; Belgium 735. |
| Potassic | 448 | 742 | Netherlands 487; Austria 200. |
| Other, n.e.s | 7,535 | 5,456 | Kuwait 2,579; Iraq 1,527; Saudi Arabia 1,294. |
| Lime | 2,092 | 1,767 | All from Lebanon. |
| Sodium and potassium compounds, caustic soda | 311 | 285 | Italy 139; Kuwait 42; Syria 32. |
| Stone, sand and gravel, dimension stone, marble | 1,076 | 2,063 | Saudi Arabia 948; Italy 497; Lebanon 472. |
| Sulfur: | | | |
| Elemental | r 481 | 2,596 | France 1,839; Lebanon 353; Kuwait 271. |
| Sulfuric acid | r 1,397 | 2,524 | Kuwait 2,490. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | -- | 222 | Yugoslavia 150; Lebanon 25; West Germany 25. |
| Carbon black | 29 | -- | |
| Coal and briquets, briquets of anthracite and bituminous coal | 314 | -- | |
| Coke and semicoke | 471 | 491 | West Germany 402; Lebanon 89. |
| Petroleum: | | | |
| Crude - thousand 42-gallon barrels | 4,721 | 5,182 | All from Saudi Arabia. |
| Refinery products: | | | |
| Gasoline ---- do | r 63 | 6 | Netherlands 3; United Kingdom 2. |
| Kerosine ---- do | r 23 | -- | |
| Lubricants ---- do | 69 | 47 | Netherlands 12; Iraq 11; Lebanon 11. |
| Other, bituminous mixtures ---- do | r 3 | -- | |
| Total ---- do | 158 | 53 | |

r Revised.

## LEBANON [6]

The indigenous mineral industry is limited to several nonmetal mining and processing operations, the most significant of which are the limestone and gypsum quarries, which support a cement industry large enough to both satisfy domestic requirements and provide about one-half million tons of cement per year for export. Because Lebanon does not produce petroleum or primary metals, these commodities are imported. Using this imported feedstock, the Nation's refineries and mills supply more than half of Lebanon's petroleum product requirements and a significant portion of requirements for metal semimanufactures. Mineral commodity production in Lebanon is shown in table 1.

The overland pipelines that deliver crude petroleum from Saudi Arabia and Iraq to Lebanon's two refineries also deliver crude oil to Mediterranean export terminals, and the Lebanese Government has realized a substantial income from transit fee payments estimated at well over $25 million per year in recent years. However, transit fee revenues were drastically reduced in 1974 as a result of economic factors that decreased the desirability of offtaking crude from Mediterranean ports and the Government's sequestering policy.

The Iraq National Oil Co. (INOC) pipeline, which connects the Northern Iraq petroleum fields with the Mediterranean export terminal at Tripoli, Lebanon, transported nearly 123 million barrels of crude oil in 1974. Exports of crude from the Tripoli terminal exceeded 111 million barrels, and deliveries to the Tripoli refinery and storage facilities absorbed the remaining 12 million barrels. Crude delivered to the 36,000-barrel-per-day capacity Tripoli refinery was priced at $2.65 per barrel in 1974 and at $2.75 per barrel in 1975, as a result of an Iraqi-Lebanese contract negotiated just before the 1973 price increases.

The petroleum price increases of 1973–74 reduced world demand and dropped world tanker rates from worldscale 400 to below worldscale 100. This created a price advantage for Persian Gulf crudes shipped around the Cape of Good Hope compared with the cost of Middle East crudes transported by overland pipeline to Mediterranean ports. Iraq adjusted its crude price downward from $13.00 per barrel in early 1974 to $11.50 per barrel in the third and fourth quarters of the year. In spite of the price adjustment, exports from the Tripoli terminal were reduced 28% from 1973 levels, proportionately reducing Lebanon's transit fee revenues.

TAPline, a subsidiary of Arabian-American Oil Co. (Aramco), transported 81 million barrels of crude oil from the Persian Gulf to the port of Sidon, Lebanon in 1974. Exports totaled 76 million barrels, and the remainder was delivered to Mediterranean Refining Co. (Medreco). In 1973 TAPline throughput to Sidon was 151 million barrels, of which 143 million barrels was exported. The price advantage for Persian Gulf crudes contributed to the reduced offtake at the TAPline Mediterranean terminal at Sidon. During the first 9 months of 1974, offtake averaged 250,000 barrels per day. By yearend offtake averaged 40,000 barrels per day, far below the 1973 average of nearly 400,000 barrels per day.

The exrefinery price dispute between the Lebanese Government and Medreco, owned by Mobil Oil Co. and Caltex Petroleum Co., remained unsettled at yearend. Under a series of temporary agreements, Medreco under fee refined crude supplied by the Lebanese Government, which in turn sequestered crude from TAPline to provide feedstock to the 17,500-barrel-per-day Medreco refinery. Negotiations continued between TAPline and the Lebanese Government on the price of crude refined at Medreco, but no settlement was reached by yearend. Until agreement is reached, TAPline has withheld payment of transit fees.

Plans for construction of a refinery backed by Saudi Arabian financing gathered momentum with the Lebanese review of a feasibility study prepared by Universal Oil Products Co. (United States). The 125,000-barrel-per-day-capacity refinery is to be near Sidon and should require 4 years to complete construction once the contract is awarded.

During 1974 the Lebanese Government granted offshore exploration concessions to Compagnie Française des Pétroles (France) and to AGIP S.p.A., a subsidiary of Ente Nazionale Idrocarburi (ENI) (Italy). No exploration activity was yet reported in 1974.

Much of Lebanon's requirements for rolled steel products and small-diameter

[6] Prepared by Bernadette Michalski.

pipe were supplied by the Byblos-Amdich rolling mill of Consolidated Steel Lebanon, S.A.L., the Tripoli rolling mill of the Lebanon Steel Co., S.A.L, and the pipe mills of Société Nationale des Tubes S.A.L. and Tubes du Levant S.A.L. A significant portion of domestic requirements for rolled and extruded nonferrous metal products were manufactured by Société pour le Commerce l'Industrie d'Aluminum et les Entreprises and by Société pour l'Industrie des Métaux. Imported scrap and primary metal forms serve as raw material for the Lebanese mills.

**Table 5.—Lebanon: Exports and reexports of selected mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, all forms | 8,215 | 9,094 | Saudi Arabia 2,133; Iraq 1,515; Syrian Arab Republic 1,264. |
| Arsenic: | | | |
| Natural sulfides | -- | 15 | Mainly to Jordan. |
| Trioxide, pentoxide acids kilograms | 200 | -- | |
| Chromium oxide and hydroxide do | 440 | 70 | All to Kuwait. |
| Copper metal including alloys, all forms | 349 | 447 | Belgium 192; Spain 140; Yugoslavia 50. |
| Gold metal including alloys, unworked and partly worked thousand troy ounces | 404 | 1,221 | France 594; United Kingdom 346; Switzerland 227. |
| Iron and steel metal: | | | |
| Scrap | r 23,886 | 53,234 | Italy 29,004; Greece 9,800; Turkey 5,150. |
| Pig iron, ferroalloys, similar materials | 71 | 83 | Libya 50; Saudi Arabia 33. |
| Steel, primary forms and semimanufactures | r 109,046 | 56,228 | United Arab Emirates 13,061; Libya 9,028; Saudi Arabia 7,984. |
| Lead metal including alloys, all forms | 216 | 322 | Saudi Arabia 149; Libya 121. |
| Magnesium metal including alloys, all forms | 37 | 23 | Belgium 21; Saudi Arabia 2. |
| Manganese oxides | 1 | 30 | All to Saudi Arabia. |
| Molybdenum metal including alloys, all forms kilograms | 1,300 | 484 | All to Kuwait. |
| Nickel metal including alloys, all forms | (1) | 31 | United Kingdom 23; Saudi Arabia 7. |
| Platinum-group metals including alloys, all forms troy ounces | r 10,069 | 1,457 | Saudi Arabia 643; Iran 354; Kuwait 257. |
| Silver metal including alloys, all forms do | 112,945 | 278,393 | Iran 258,042; Syrian Arab Republic 15,754; United Kingdom 2,636. |
| Tin metal including alloys, all forms long tons | 1 | 2 | Saudi Arabia 1; Cyprus 1. |
| Titanium oxides | 15 | 24 | Syrian Arab Republic 14; Iraq 10. |
| Tungsten metal including alloys, all forms[2] kilograms | r 317 | -- | |
| Zinc: | | | |
| Oxide | 26 | (1) | All to Cyprus. |
| Metal including alloys, all forms | 5 | 74 | France 28; Belgium 28; Syrian Arab Republic 15. |
| Other: | | | |
| Ore and concentrate | -- | 2 | All to Libya. |
| Ash and residues containing nonferrous metals | r 501 | 1,442 | Italy 506; Belgium 473; Netherlands 298. |
| Waste and sweepings of precious metals kilograms | 129 | 540 | United Kingdom 515; West Germany 24. |
| Metals including alloys, all forms: | | | |
| Alkali, alkaline earth, rare-earth metals | -- | 16 | Saudi Arabia 11; Libya 5. |
| Base metals including alloys, all forms, n.e.s kilograms | 305 | 26 | Mainly to Saudi Arabia. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 85 | 268 | Jordan 218; Kuwait 18; Libya 12. |

See footnotes at end of table.

**Table 5.—Lebanon: Exports and reexports of selected mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Abrasives, natural, n.e.s.—Continued | | | |
| Dust and powder of diamond kilograms | 1 | 1 | Mainly to Netherlands. |
| Grinding and polishing wheels and stones | 144 | 168 | Saudi Arabia 36; Qatar 35; Kuwait 28. |
| Asbestos | 866 | 2,358 | United Arab Emirates 2,027; Saudi Arabia 189; Iraq 134. |
| Cement | 454,029 | 381,744 | Libya 189,188; Syrian Arab Republic 88,999; Nigeria 26,501. |
| Chalk | 54 | 7 | Mainly to Saudi Arabia. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s | 61 | 59 | Saudi Arabia 21; Italy 17; Jordan 7. |
| Products: | | | |
| Refractory (including nonclay bricks) | 368 | 216 | Saudi Arabia 130; Jordan 41; Kuwait 29. |
| Nonrefractory | 1,754 | 2,829 | Saudi Arabia 1,059; Jordan 483; Libya 414. |
| Diamond: | | | |
| Crude carats | -- | 27,085 | India 17,520; Belgium 8,000. |
| Worked, not set or strung do | 5,590 | 2,830 | Belgium 1,420; Netherlands 440. |
| Diatomite and other infusorial earth | 92 | 705 | Libya 600; Syrian Arab Republic 79; Saudi Arabia 25. |
| Fertilizer materials: | | | |
| Crude, nitrogenous | r 242 | 62 | All to Jordan. |
| Manufactured: | | | |
| Nitrogenous | 68,600 | 67,822 | Turkey 67,374; Jordan 159; Iraq 100. |
| Phosphatic | 105,070 | 166,181 | Bulgaria 63,225; Turkey 20,000; Hungary 14,558. |
| Potassic | -- | 2 | All to Saudi Arabia. |
| Other, including mixed | 5 | 69,705 | Turkey 60,198; Libya 7,600; Saudi Arabia 1,850. |
| Ammonia | 1 | 3 | Saudi Arabia 2. |
| Gem stones, precious and semiprecious, except diamond thousand carats | 2,537 | 2,261 | France 1,140; Switzerland 521; United States 116. |
| Graphite | 6 | 10 | Kuwait 4; Jordan 3. |
| Gypsum and plasters | 909 | 2,253 | Libya 2,125; Jordan 99; Saudi Arabia 24. |
| Lime | 71,765 | 71,467 | Libya 66,829; Syrian Arab Republic 2,331; Jordan 1,718. |
| Mica, all forms kilograms | 427 | 265 | All to Arab Republic of Egypt. |
| Pigments, mineral, including processed iron oxides | 134 | 191 | Libya 66; Syrian Arab Republic 50; Saudi Arabia 37. |
| Salt | 145 | 55 | Saudi Arabia 26; Kuwait 18. |
| Sodium and potassium compounds, n.e.s | 126 | 70 | Saudi Arabia 46; Jordan 16. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous | 2,274 | 1,054 | Kuwait 521; Saudi Arabia 272; Jordan 218. |
| Other | 229 | 120 | Kuwait 68; Saudi Arabia 26; Syrian Arab Republic 23. |
| Worked | 3,920 | 2,123 | Kuwait 1,124; Saudi Arabia 715; Jordan 97. |
| Gravel and crushed rock | r 673 | 1,170 | Jordan 765; Saudi Arabia 188; Kuwait 102. |
| Limestone (except dimension) | 18 | -- | |
| Sand, excluding metal bearing | 504 | 488 | Syrian Arab Republic 259; Saudi Arabia 120; United Arab Emirates 34. |
| Sulfur: | | | |
| Elemental, all forms | 2,223 | 919 | Syrian Arab Republic 431; Jordan 295; Iraq 160. |
| Sulfuric acid | 2,398 | 2,551 | Syrian Arab Republic 1,384; Libya 1,139. |
| Talc, steatite, soapstone, pyrophyllite | 14 | 11 | Libya 5; Saudi Arabia 3; Ghana 2. |
| Other nonmetals, n.e.s.: | | | |
| Crude: | | | |
| Meerschaum, amber, jet kilograms | 250 | 200 | All to United Arab Emirates. |
| Other | -- | 15 | Mainly to Saudi Arabia. |

See footnotes at end of table.

Table 5.—Lebanon: Exports and reexports of selected mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Other nonmetals, n.e.s—Continued | | | |
| Slag, dross and similar waste, not metal bearing: | | | |
| From iron and steel manufacture | 100 | 34 | Belgium 32; West Germany 2. |
| Slag and ash, n.e.s | 123 | -- | |
| Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s | 33 | 15 | Qatar 13. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 10 | 27 | West Germany 16; Italy 10; Syrian Arab Republic 1. |
| Carbon black | 100 | -- | |
| Coal, all grades, including briquets | 318 | 262 | Jordan 107; Kuwait 74; Saudi Arabia 55. |
| Coke and semicoke | 1,274 | 439 | Jordan 116; Saudi Arabia 110; Iraq 80. |
| Hydrogen and rare gases | 2 | 1 | All to Syrian Arab Republic. |
| Peat, including peat briquets and litter | -- | 25 | Mainly to Libya. |
| Petroleum refinery products: | | | |
| Gasoline, thousand 42-gallon barrels | r 76 | 55 | Bunkers 52; Iraq 2. |
| Kerosine, do | r 2,341 | 2,788 | Bunkers 2,673; Syrian Arab Republic 97. |
| Distillate and residual fuel oil, do | 3,459 | 1,652 | Bunkers 1,504; Italy 148. |
| Lubricants, do | r 48 | 83 | Syrian Arab Republic 49; Kuwait 12; Jordan 8. |
| Other: | | | |
| Liquefied petroleum gas, do | 4 | 21 | Mainly to Syrian Arab Republic. |
| Unspecified, do | r 3 | 21 | Mainly to Syrian Arab Republic. |
| Total | r 5,931 | 4,600 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 102 | 148 | Cyprus 82; bunkers 55; Kuwait 11. |

r Revised.
[1] Less than ½ unit.
[2] May include some manufactured materials, reported inseparably from unwrought and semimanufactured forms.

Table 6.—Lebanon: Imports of selected mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Oxide and hydroxide[1] | 193 | 163 | West Germany 120; France 40. |
| Metal including alloys, all forms | 11,292 | 12,545 | Greece 6,427; France 3,967; Canada 789. |
| Arsenic: | | | |
| Natural sulfides | -- | 1 | All from Iran. |
| Trioxide, pentoxide, acids | 12 | 15 | All from France. |
| Chromium oxide and hydroxide | 66 | 22 | Netherlands 10; West Germany 6; United Kingdom 4. |
| Cobalt oxide and hydroxide, kilograms | 16 | 719 | Mainly from West Germany. |
| Columbium and tantalum, tantalum metal including alloys, all forms, do | -- | 42 | Belgium 40; United Kingdom 2. |
| Copper metal including alloys, all forms | 3,940 | 4,869 | Canada 1,474; United Kingdom 1,450; Zaire 922. |
| Gold metal including alloys, unworked or partly worked, thousand troy ounces | 1,288 | 711 | Switzerland 318; United Kingdom 101; Kuwait 100. |
| Iron and steel metal: | | | |
| Scrap | 8,456 | 41,668 | Kuwait 17,480; Saudi Arabia 11,559; Jordan 8,971. |
| Pig iron, ferroalloys, similar materials | 10,777 | 16,037 | U.S.S.R. 8,354; Hungary 7,488. |

See footnotes at end of table.

## Table 6.—Lebanon: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| **Iron and steel metal—Continued** | | | |
| Steel: | | | |
| Common grades: | | | |
| Primary forms | 163,971 | 218,892 | Bulgaria 73,648; U.S.S.R. 36,871; France 32,077. |
| Semimanufactures | 184,564 | 229,453 | Czechoslovakia 54,923; France 26,948; East Germany 21,350. |
| Alloys and high carbon, primary forms and semimanufactures | 1,816 | 3,279 | Spain 1,059; West Germany 811; Japan 585. |
| Lead: | | | |
| Oxide | 134 | 103 | France 48; United Kingdom 38; People's Republic of China 10. |
| Metal including alloys, all forms | 1,381 | 2,106 | United Kingdom 447; Kuwait 436; Libya 290. |
| Magnesium metal including alloys, all forms | 6 | 23 | Kuwait 18; Jordan 3. |
| Manganese oxides | 6 | (2) | All from West Germany. |
| Molybdenum metal including alloys, all forms—kilograms | r 97 | 1,141 | Mainly from West Germany. |
| Nickel metal including alloys, all forms | 18 | 34 | West Germany 14; Switzerland 5; Finland 5. |
| Platinum-group metals including alloys, all forms—thousand troy ounces | 6 | 25 | France 16; West Germany 5; Switzerland 2. |
| Silver metal including alloys, all forms—do | 1,163 | 853 | Switzerland 675; United Kingdom 67; France 43. |
| Tin metal including alloys, all forms—long tons | 35 | 73 | Iraq 33; United Kingdom 27. |
| Titanium oxides | 1,520 | 1,637 | West Germany 714; United Kingdom 647; France 163. |
| Tungsten metal including alloys, all forms[3]—kilograms | 84 | 101 | United Kingdom 95; France 6. |
| Zinc: | | | |
| Oxide | 91 | 160 | France 51; Netherlands 50; United Kingdom 27. |
| Metal including alloys, all forms | 954 | 1,188 | Belgium 1,038; Italy 54; North Korea 56. |
| Other: | | | |
| Ore and concentrate | 137 | 170 | Australia 64; United States 50; Japan 40. |
| Ash and residue containing nonferrous metals | 282 | 713 | Syrian Arab Republic 303; Jordan 265; Iraq 145. |
| Waste and sweepings of precious metals—kilograms | 471 | 273 | Hong Kong 157; Libya 70; U.S.S.R. 35. |
| Oxides, hydroxides, and peroxides of metals, n.e.s | r 18 | 27 | West Germany 11; Belgium 5; Hungary 5. |
| **Metals including alloys, all forms:** | | | |
| Metalloids | 14 | 2 | Mainly from West Germany and Netherlands. |
| Alkali, alkaline earth, rare-earth metals | 2 | 1 | Mainly from United States and United Kingdom. |
| Pyrophoric alloys | 1 | 8 | West Germany 3; People's Republic of China 3. |
| Base metals including alloys, all forms, n.e.s | 5 | 1 | Mainly from Czechoslovakia. |
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| **Pumice, emery, natural corundum, etc** | 728 | 101 | Italy 65; Turkey 21; France 8. |
| Dust and powder of diamond—kilograms | 3 | 3 | France 1; Netherlands 1. |
| Grinding and polishing wheels and stones | 295 | 319 | Italy 167; Austria 43; Spain 32. |
| Asbestos | 6,390 | 8,218 | Republic of South Africa 4,248; Canada 2,894; Cyprus 1,033. |
| Barite and witherite | -- | 6 | West Germany 5; Greece 1. |
| Boron materials: | | | |
| Crude natural borates | -- | 4 | Mainly from France. |
| Oxide, acid, borates | 2,772 | 3,553 | France 1,027; Switzerland 906; Turkey 578. |

See footnotes at end of table.

**Table 6.—Lebanon: Imports of selected mineral commodities—Continued**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Cement | 430 | 430 | All from France. |
| Chalk | 963 | 1,052 | Belgium 800; France 140; Spain 50. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s | 11,052 | 18,150 | Turkey 6,885; Czechoslovakia 6,055; United Kingdom 2,975. |
| Products: | | | |
| Refractory (including nonclay brick) | r 4,585 | 5,027 | Morocco 817; People's Republic of China 768; West Germany 513. |
| Nonrefractory | r 14,736 | 20,124 | Italy 15,150; France 959; Spain 722. |
| Diamond: | | | |
| Crude ---- carats | 18,080 | 18,695 | Belgium 5,085; Ghana 4,540; Zaire 3,305. |
| Worked, not set or strung - do | 48,140 | 48,345 | Belgium 19,110; India 17,185; Ghana 8,430. |
| Diatomite and other infusorial earth | 720 | 149 | United States 122; West Germany 25; United Kingdom 2. |
| Feldspar and fluorspar | 1,195 | 2,549 | Italy 1,845; Spain 313; Republic of South Africa 220. |
| Fertilizer materials: | | | |
| Natural: | | | |
| Nitrogenous | 6,000 | 100 | All from West Germany. |
| Phosphatic | 102,169 | 342,601 | Jordan 120,163; Morocco 69,437; Senegal 30,910. |
| Potassic | 418 | (2) | All from West Germany. |
| Manufactured: | | | |
| Nitrogenous | 112,421 | 84,356 | Italy 27,914; West Germany 20,428; France 13,014. |
| Phosphatic | -- | 1 | All from West Germany. |
| Potassic | r 2,278 | 1,706 | Spain 1,110; West Germany 596. |
| Other, including mixed | 18,381 | 19,238 | West Germany 10,145; Belgium 7,550; Netherlands 1,509. |
| Ammonia | 2,920 | 1,534 | Algeria 1,445; Netherlands 76. |
| Graphite, natural | 78 | 20 | West Germany 10; France 10. |
| Gypsum and plasters | 67,497 | 56,866 | Syrian Arab Republic 36,545; Cyprus 20,295. |
| Lime | 52 | 141 | Syrian Arab Republic 118; United Kingdom 20. |
| Magnesite | 88 | 61 | Netherlands 55; West Germany 6. |
| Mica, all forms | 36 | 37 | Romania 29; Norway 6. |
| Pigments, mineral: | | | |
| Natural | 53 | 52 | Belgium 17; United Kingdom 16; West Germany 12. |
| Iron oxides, processed | 209 | 242 | West Germany 98; Spain 53; United Kingdom 47. |
| Precious and semiprecious stones, except diamond: | | | |
| Natural ---- thousand carats | 21,668 | 36,152 | Brazil 11,389; Republic of South Africa 5,670; West Germany 4,740. |
| Manufactured ---- do | 12,080 | 14,110 | France 6,385; Italy 3,000; Republic of South Africa 2,165. |
| Pyrite (gross weight) | 8 | -- | |
| Salt and brine | 218 | 3 | Mainly from West Germany. |
| Sodium and potassium compounds, n.e.s | 3,608 | 6,636 | Italy 4,321; Romania 1,000; France 455. |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked: | | | |
| Calcareous | 33,812 | 56,743 | Italy 30,679; Portugal 8,841; Greece 7,454. |
| Other | 6,380 | 8,654 | Syrian Arab Republic 8,003; Italy 586. |
| Worked | 415 | 256 | Syrian Arab Republic 191; Italy 25; United Kingdom 16. |
| Dolomite, chiefly refractory grade | 1 | -- | |
| Gravel and crushed stone | 8,915 | 11,175 | Italy 7,159; Jordan 2,937; Syrian Arab Republic 660. |
| Limestone | -- | (2) | All from United Arab Emirates. |
| Quartz and quartzite | (2) | 10 | Mainly from Netherlands. |
| Sand, excluding metal bearing | 2,555 | 3,941 | Syrian Arab Republic 3,853; Iraq 28; France 26. |

See footnotes at end of table.

## Table 6.—Lebanon: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 72,975 | 72,666 | France 57,435; Iraq 13,940; Syrian Arab Republic 694. |
| Colloidal | 904 | 630 | France 475; West Germany 85; Portugal 50. |
| Sulfur dioxide | 32 | 23 | Mainly from France. |
| Sulfuric acid | 7,088 | 3,028 | Poland 2,990; Netherlands 30. |
| Talc, steatite, soapstone, pyrophyllite | 957 | 737 | People's Republic of China 269; Norway 233; U.S.S.R. 187. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 2 | (2) | Mainly from Malagasy Republic. |
| Slag, dross and similar waste, not metal bearing | 200 | 382 | Iraq 234; Syrian Arab Republic 103; Jordan 29. |
| Oxides and hydroxides of magnesium, strontium, and barium | 52 | 3 | United Kingdom 1; Japan 1. |
| Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s | 9 | 200 | France 80; Romania 58; People's Republic of China 38. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 10 | 75 | Syrian Arab Republic 50; Romania 18. |
| Carbon black | 93 | 107 | United States 81; West Germany 18; France 7. |
| Coal, all grades | 609 | 550 | Mainly from Belgium. |
| Coke and semicoke | 6,882 | 15,337 | Poland 11,364; France 3,973. |
| Hydrogen and rare gases | 7 | 5 | France 4. |
| Peat, including peat briquets and litter | 122 | 286 | Romania 150; U.S.S.R. 123; West Germany 13. |
| Petroleum refinery products: | | | |
| Gasoline thousand 42-gallon barrels | 3,811 | 4,081 | Iraq 3,142; Saudi Arabia 932. |
| Kerosine do | 282 | 276 | Iraq 187; Saudi Arabia 57; Italy 22. |
| Distillate and residual fuel oil do | 6,623 | 8,242 | Iraq 4,387; Saudi Arabia 3,683; Italy 172. |
| Lubricants do | r 153 | 186 | Italy 87; United Kingdom 52; Romania 15. |
| Other: | | | |
| Liquefied petroleum gas do | 989 | 951 | Italy 373; Iraq 363; Saudi Arabia 154. |
| White spirit do | 15 | 16 | Netherlands 8; United Kingdom 4; Belgium 2. |
| Mineral jelly and wax do | 9 | 9 | People's Republic of China 2; Romania 2; Hungary 2. |
| Bitumen and other residues do | 154 | 149 | Mainly from Iraq. |
| Bituminous mixtures, n.e.s do | 9 | 8 | Syrian Arab Republic 4; United Kingdom 2; Netherlands 1. |
| Pitch, pitch coke, petroleum coke do | 2 | 4 | Italy 1; Netherlands 1; Iraq 1. |
| Unspecified do | 5 | 7 | Belgium 6. |
| Total do | r 12,052 | 13,929 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | r 899 | 1,225 | Netherlands 921; United Kingdom 295. |

r Revised.
1 Includes artificial corundum.
2 Less than ½ unit.
3 May include some manufactured materials, reported inseparably from unwrought and semimanufactured forms.

## OMAN [7]

Exploration results have indicated that Oman has a potential for a diversified mineral economy, and investment capital is being sought to develop deposits of copper, chrome, and manganese. For the present, however, the petroleum industry continues to sustain the Oman Government, supplying about 95% of government revenues. These revenues are largely invested in infrastructure development.

Crude petroleum production averaged more than 290,500 barrels per day from four fields operated by Petroleum Development Oman, Ltd. (PDO). Production by field was as follows, in thousand barrels per day:

| Field | 1973 | 1974 |
|---|---|---|
| Fahud | 115.3 | 107.7 |
| Yibal | 87.2 | 93.2 |
| Natih | 51.1 | 49.9 |
| Al Huwaisah | 39.3 | 39.7 |

Production continued to decline as a result of pressure loss; however, secondary recovery waterflood operations have been undertaken in the Yibal, Fahud, and Natih Fields. Three new fields are under development in central Oman; when brought into production in 1975 they should augment Oman's petroleum production by 50,000 to 90,000 barrels per day. Future production, like current production, will be transported by pipeline to the export terminal Mina al Fahal.

During 1974 over 1 billion cubic feet of associated gas was produced. Most of this production was flared because gas reserves are too limited to warrant the high cost of constructing liquefied natural gas (LNG) production and export facilities. Feasibility studies are, however, under consideration for utilizing associated gas in power generation and fertilizer production.

The Government of Oman, having acquired 25% interest in PDO during 1973, increased its participation to 60% in 1974. This action readjusted equity holdings, with Royal Dutch/Shell holding 34%, CFP holding 4%, and Portuguese Participation and Exploration Corp. (Partex) holding the remaining 2%.

## PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN [8]

Commercial production of mineral commodities is limited to salt and to petroleum products which are refined from imported crude oil. While copper deposits containing gold and silver are reported in the Maahir-Ghabor area, further exploration is required to determine if these deposits are commercially exploitable. Financial assistance is anticipated from the United Arab Emirates to support a broad exploration program. Final agreements on exploration financing should be reached in 1975. Petroleum exploration was initiated in 1971 in the Hadhramaut area by the South Yemeni Algerian Petroleum Co. (SYAPCO), in which the State petroleum agency holds 51% equity and Société Nationale pour la Récherche, la Production, le Transport, la Transformation, et al Commercialisation des Hydrocarbures (SONATRACH) holds 49% equity. No discoveries were reported by SYAPCO. The People's Democratic Republic of Yemen is considering opening additional territories for hydrocarbon exploration by 1975.

The Aden refinery processed an estimated 68,000 barrels per day of crude oil in 1974. Most of the crude oil imports came from Iran, Kuwait, and Egypt. The bulk of Aden refinery products are exported. To permit easier tanker access to crude unloading and products loading facilities, the petroleum harbor at Aden was being dredged in 1974, to increase the depth from 40 to 41 feet.

Commercial salt production is conducted at the Khawr Maksar evaporating ponds under the direction of the state-owned General Salt Organization. Enough evaporated salt is produced to supply domestic consumption requirements and to permit limited quantities for export.

Refer to table 7 for exports and reexports of mineral commodities.

[7] Prepared by Bernadette Michalski.
[8] Prepared by Bernadette Michalski.

**Table 7.—People's Democratic Republic of Yemen: Imports, exports and reexports of selected mineral commodities**
(Thousand 42-gallon barrels unless otherwise specified)

| Commodity | 1972 | 1973 | 1974 |
|---|---|---|---|
| EXPORTS AND REEXPORTS | | | |
| Petroleum refinery products: | | | |
| Gasoline | 3,500 | 3,369 | 3,720 |
| Jet fuel | 3,320 | 2,377 | 1,889 |
| Kerosine | 1,000 | 1,160 | 1,071 |
| Distillate fuel oil | 2,510 | 3,530 | 3,788 |
| Residual fuel oil | 12,636 | 10,090 | 6,890 |
| Other | 155 | 42 | 30 |
| Total | 23,121 | 20,568 | 17,388 |
| Salt [1] metric tons | 15,163 | -- | -- |
| BUNKER LOADINGS | | | |
| Petroleum refinery products: | | | |
| Distillate fuel oil | 375 | NA | 404 |
| Residual fuel oil | 1,760 | NA | 1,104 |
| Total | 2,135 | NA | 1,508 |
| IMPORTS | | | |
| Petroleum, crude | 26,500 | 22,257 | 19,930 |
| Petroleum refinery products: | | | |
| Gasoline | 242 | 254 | 617 |
| Jet fuel and kerosine | 1 | 50 | 303 |
| Distillate fuel oil | 961 | 1,425 | 598 |
| Residual fuel oil | 614 | 304 | 34 |
| Lubricants | 15 | 14 | -- |
| Other | -- | -- | -- |
| Total | 1,833 | 2,047 | 1,552 |

NA Not available.
[1] Japanese imports from People's Democratic Republic of Yemen.

## QATAR [9]

Government income realized from the petroleum industry in the form of royalties, taxes, and the sale of participation crude was estimated at $1.8 billion in 1974, or about 95% of total government revenues.

During 1974 a government decree established the Qatar General Petroleum Organization (QGPO), a government-owned agency with a mandate to engage in all phases of the oil industry. The QGPO represents the Government's equity in the Qatar Petroleum Co., Ltd. (QPC). This equity was increased from 25% to 60% in 1974, adjusting equity holdings as follows: QCPO 60%, British Petroleum Co., Ltd. 9.5%, Royal Dutch/Shell 9.5%, Compagnie Française des Pétroles 9.5%, Near East Development, 9.5%, and Partex 2.0%.

Government equity in the Shell Oil Co. of Qatar (SOCQ) was also increased from 25% to 60% in 1974, lowering Royal Dutch/Shell equity from 75% to 40%. The QGPO also represents Government equity in the Arab Maritime Petroleum Transportation Co., the Arab Petroleum Pipelines Co., the National Oil Distribution Co., and the Arab Company for Shipbuilding and Repair.

More than half of Qatar's crude oil production was produced by SOCQ which averaged more than 295,000 barrels per day of 36° API crude from three offshore fields. These fields are linked by subsea pipelines to the export terminal at Halul Island. Production by field was as follows, in thousands of barrels per day:

| Field | 1973 | 1974 |
|---|---|---|
| Bul Hanine | 143.9 | 142.0 |
| Maydan-Mahzan | 137.4 | 129.8 |
| Idd El Shargi | 38.0 | 23.2 |

The remainder of Qatar's crude production was obtained from 57 wells in the onshore Dukhan Field operated by QPC. Daily production averaged over 223,000 barrels of 40° API gravity crude. About 221,500 barrels per day was exported from

[9] Prepared by Bernadette Michalski.

the Umm Said terminal. Of the remainder, about 525 barrels per day was utilized in the powerplant and desalination plant. About 265 barrels per day was delivered to the state-owned topping plant at Umm Said, which operated through October 1974, and by yearend a total of 250,000 barrels of Dukhan Field crude had been delivered to the National Oil Distribution Co. 6,800-barrel-per-day-capacity refinery, which was commissioned in mid-September. At yearend the QPC natural gas liquid plant was commissioned. Supplied with Dukhan Field associated gas, the plant will eventually produce 800,000 tons of natural gas liquids per year. The bulk of the plant output will be exported to Japan.

Although the petroleum industry continued to dominate Qatar's mineral economy, the Government of Qatar has entered into a series of agreements launching the nation's first iron and steel works. Qatar Steel Co. Ltd. with 70% equity held by the Government of Qatar, 20% equity held by Kobe Steel, Ltd. of Japan, and 10% equity held by Tokyo Boeki Ltd. also of Japan, will build a 400,000-ton-per-year capacity iron and steel plant at Umm Said. Plant construction was to begin in 1975 with completion scheduled for 1977. About 75,000 tons of plant products will be absorbed by the domestic market, with the remaining production destined for the export market. Kobe Steel will be responsible for plant management, and Tokyo Boeki will handle marketing abroad. The plant will employ the Midrex (United States) direct reduction process for sponge iron production. The total cost of the project is estimated at $200 million.

Qatar National Cement Co. operates Qatar's sole cement manufacturing facility. The Umm Bab plant capacity was expanded to 220,000 tons per year in 1974. Plant products include portland cement for building construction and sulfated cement for marine foundations.

**Table 8.—Qatar: Exports of crude oil by destination**
(Thousand 42-gallon barrels)

| Country | 1972 | 1973 | 1974 |
|---|---|---|---|
| Australia | 4,271 | 4,198 | 3,906 |
| France | 16,425 | 25,514 | 29,018 |
| Germany, West | 1,935 | 803 | 5,183 |
| Italy | 20,805 | 24,017 | 21,061 |
| Netherlands | 44,713 | 52,706 | 5,950 |
| Philippines | 3,030 | 1,314 | 3,066 |
| South Africa, Republic of | 10,403 | 22,594 | -- |
| Sweden | 5,475 | 2,920 | 5,183 |
| Thailand | 16,206 | 21,024 | 17,995 |
| United Kingdom | 26,609 | 23,652 | 35,405 |
| United States | 1,278 | 3,979 | 621 |
| Other | 24,671 | 25,439 | 59,200 |
| Total | 175,821 | 208,160 | 186,588 |

Source: Organization of the Petroleum Exporting Countries, Statistics Unit. Annual Statistical Bulletin 1974. Vienna 1975, p. 70.

**Table 9.—Qatar: Estimated imports of petroleum refinery products**
(Thousand 42-gallon barrels)

| Product | 1972 | 1973 | 1974 |
|---|---|---|---|
| Gasoline | 340 | 340 | 369 |
| Jet fuel and kerosine | 38 | 40 | 158 |
| Distillate fuel oil | 283 | 290 | 405 |
| Lubricants | 25 | 25 | 14 |
| Asphalt | 30 | 30 | 147 |
| Total | 716 | 725 | 1,093 |

## SYRIAN ARAB REPUBLIC [10]

Indigenous mineral resources of commercial value include petroleum and natural gas, phosphate rock, gypsum, and rock salt. Table 1 lists production of mineral commodities. The petroleum industry contributes substantially to the Syrian economy, both directly through production and processing and indirectly through fees paid for Iraqi and Saudi Arabian oil transiting Syria via pipelines linking producing fields with Mediterranean shipping terminals. The Ministry for Petroleum and Mineral Resources allotted 95% of its $240 million budget for 1974 for development and expansion of all phases of the domestic petroleum industry. Exploration activity was accelerated by the opening of nearly 18,000 square kilometers for exploration and development under service contract arrangements. Crude petroleum production from the Karachok, Rumailan, and Sawaidiyah Fields in northeastern Syria increased from 105,000 barrels per day in 1973 to 124,000 barrels per day in 1974. Projections for 1975 were placed at 175,000 barrels per day. The bulk of Syria's output, or nearly 118,000 barrels per day was exported, earning $434 million in foreign exchange in 1974. The remaining production was blended with lighter Kirkuk crude imported from Iraq and refined at the Homs refinery where throughput averaged 35,000 barrels per day in 1974. A contract was awarded to Romania's Industrial Export Organization for the construction of a 120,000-barrel-per-day capacity refinery at Banias. The refinery is scheduled to be completed in 1977 at a cost of $297 million. Feedstock for the Banias refinery will be 36° API gravity Iraqi crude, and 25° API gravity Syrian crude at a 4:1 ratio.

Syrian revenues obtained from transit fees levied on petroleum produced in Iraq and Saudi Arabia and carried via pipeline across Syria were reported as $164.3 million in 1974. The bulk of transit fee payments were obtained from Iraq whose shipments via the INOC pipeline to Tripoli and Banias averaged nearly 840,000 barrels per day crossing about 450 kilometers of Syrian territory. Shipment of Saudi Arabian crude via TAPline, which crosses nearly 200 kilometers of Syrian territory on its journey to the export terminal at Sidon, averaged nearly 223,000 barrels per day in 1974.

While petroleum production, processing, and transportation dominate the Syrian mineral industry, investments in phosphate rock production and in cement and fertilizer manufacturing are showing promising returns. The development of phosphate rock deposits at Khunaifis and al Sharqiyah A and B should bring annual production to 1.35 million tons by 1975. Expansion of existing cement plants and construction of new facilities should bring cement production to 6 million tons per year by 1980. Fertilizer production at Homs was expanded from 300 tons per day to 700 tons per day in 1974, with expansion to 1,000 tons per day planned by 1978.

## UNITED ARAB EMIRATES [11]

The United Arab Emirates, formed in 1971, is a federation of seven independent sheikdoms. Included in the federation are Abu Dhabi, Ajman, Dubai, Fujairah, Ras al-Khaimah, Sharjah, and Umm al-Qaiwain.

The Presidency and Vice-Presidency of the federation are held respectively by the rulers of Abu Dhabi and Dubai, the major oil producing emirates.

Table 1 gives mineral production statistics on the United Arab Emirates.

**Nonmetallic Minerals.**—*Cement.*—The Abu Dhabi Government has allocated $10 million and started construction of a 200,000-ton-per-year cement plant.

A preliminary agreement for construction of the Dubai national cement plant was signed by the Dubai Government and Costain Civil Engineering. The $45 million [12] plant will have a capacity of 500,000 tons per year, which will make it the largest in the Persian Gulf and provide Dubai with another export commodity.

In Ras al-Khaimah the Union Cement

[10] Prepared by Bernadette Michalski.
[11] Prepared by Daniel C. Adkins.
[12] Where necessary, values have been converted from United Arab Emirates dirhams to U.S. dollars at the rate of UAED3.95 = US$1.00.

Co. neared completion of its 250,000-ton-per-year-capacity cement plant at Khor Kuwait. The plant is being built by Mothercat Ltd. (United Kingdom-Lebanon) at a cost of $14 million.

**Mineral Fuels.**—*Natural Gas.*—Abu Dhabi's Government moved to utilize its onshore natural gas reserves by awarding Suedrohrbau GmbH & Co. K.G. (West Germany) a contract to build a 24- and 18-inch natural gas pipeline from the Habskan production area to the city of Abu Dhabi. The 152-kilometer pipeline was scheduled for operation in early 1976 and should supply fuel for a gas turbine electric power project and other needs.

During 1974 Abu Dhabi Gas Liquefaction Co., Ltd. (ADGLC) continued construction of its Das Island natural gas liquefaction plant and expanded the design to include production of 220,000 tons per year of light distillate and 230,000 tons per year of sulfur. Air Products & Chemicals Inc. (United States) is to design the 2.2-million-ton-per-year liquefaction process and provide the needed heat exchangers. British Ropeway Engineering Co. was awarded a contract for sulfur reclaiming, storage, and loading facilities. The main contractors are the Bechtel Corp. (United States) for engineering and Chiyoda Chemical Engineering and Construction Co. (Japan) for construction. When the plant is completed in 1976, associated gas from Abu Dhabi Marine Areas, Ltd. (ADMA) offshore operations will be used to produce 3 million tons per year of liquefied gas for the Tokyo Electric Power Co. of Japan. In late 1974, the Abu Dhabi National Oil Co. (ADNOC) increased its participation to 51%. (See table 10 for 1974 participation figures.)

The Government of Dubai and Sunningdale Oils Ltd. of Canada signed a letter of intent for a 15-year joint venture to gather and market Dubai's associated gas, which is currently being flared. Sunningdale will conduct feasibility and design studies for a proposed plant to recover 700,000 tons per year of natural gas liquids from the associated gas.

**Table 10.—Concessions held in the United Arab Emirates during 1974**

| Location and company | Ownership (percent) | Nationality of company | Area (square kilometers) |
|---|---|---|---|
| **ABU DHABI** | | | |
| Onshore: | | | |
| Abu Dhabi Petroleum Co., Ltd. (ADPC) operator | -- | -- | 40,000 |
| Abu Dhabi National Oil Co. (ADNOC) | 60.00 | United Arab Emirates | |
| British Petroleum Co., Ltd. (BP) | 9.50 | United Kingdom | |
| Compagnie Française des Pétroles (CFP) | 9.50 | France | |
| Near East Development Corp.: | | | |
| Exxon Corp. (Exxon) | 4.75 | United States | |
| Mobil Oil Corp. (Mobil) | 4.75 | ---- do ---- | |
| Shell International Petroleum Co., Ltd. (Shell) | 9.50 | United Kingdom-Netherlands | |
| Portugese Participations and Explorations Corp. (Partex) | 2.00 | Portugal | |
| Abu Dhabi Phillips Petroleum Co. (Phillips) operator | 50.00 | United States | 12,943 |
| AGIP S.p.A. | 50.00 | Italy | |
| Middle East Oil Co., Ltd., Mitsubishi et al. | 100.00 | Japan | 13,926 |
| Offshore: | | | |
| Abu Al Bu Koosh Oil Co., Ltd | -- | -- | 109 |
| CFP operator | 51.00 | France | |
| New England Petroleum Co. (NEPCO) | 24.50 | United States | |
| Armerada Hess Corp | 12.25 | ---- do ---- | |
| Sunningdale Oils Ltd | 12.25 | Canada | |
| Abu Dhabi Gas Liquefaction Co., Ltd. (ADGLC) | -- | -- | [1]80,080 |
| ADNOC | 51.00 | United Arabs Emirates | |
| BP | 16.00 | United Kingdom | |
| CFP | 8.00 | France | |
| Mitsui and Co., Ltd | 23.00 | Japan | |
| Bridgestone Liquefied Gas Co., Ltd | 2.00 | ---- do ---- | |

See footnotes at end of table.

## Table 10.—Concessions held in the United Arab Emirates during 1974—Continued

| Location and company | Ownership (percent) | Nationality of company | Area (square kilometers) |
|---|---|---|---|
| **ABU DHABI—Continued** | | | |
| **Offshore—Continued** | | | |
| Abu Dhabi Marine Areas Ltd. (ADMA) operator | -- | -- | 31,080 |
| ADNOC | 60.00 | United Arab Emirates | |
| BP | 14.67 | United Kingdom | |
| CFP | 13.33 | France | |
| Japan Oil Development Co., Ltd. (JODC) | 12.00 | Japan | |
| Abu Dhabi Oil Co., Ltd. (ADOC) | -- | -- | 4,416 |
| ADNOC | 51.00 | United Arab Emirates | |
| Maruzen Oil Co., Ltd | | Japan | |
| Daikyo Oil Co., Ltd | 49.00 | ---- do | |
| Nippon Mining Co., Ltd | | ---- do | |
| Amerada Hess Corp. of Abu Dhabi operator | -- | -- | NA |
| Amerada Hess Corp | 31.50 | United States | |
| Pan Ocean Oil Corp | 31.50 | United Kingdom | |
| Bow Valley Industries Ltd | 20.00 | Canada | |
| Wingate Enterprises | 12.00 | United Kingdom | |
| Houston Oil Canada | 5.00 | Canada | |
| Sunningdale Oils Ltd | 100.00 | ---- do | 2,820 |
| **AJMAN** | | | |
| **Onshore:** | | | |
| United Refining Co. operator | 75.00 | United States | 44 |
| Asamera Oil Corp., Ltd | 25.00 | Canada | |
| **Offshore:** | | | |
| United Refining Co. operator | 75.00 | United States | 600 |
| Asamera Oil Corp., Ltd | 25.00 | Canada | |
| Occidental Petroleum Corp | 100.00 | United States | NA |
| **DUBAI** | | | |
| **Offshore:** | | | |
| Dubai Petroleum Co. (DPC) | -- | -- | 3,360 |
| Continental Oil Co. (Conoco) operator | 30.00 | United States | |
| Dubai Marine Areas Ltd. (DUMA) | | | |
| CFP | 25.00 | France | |
| Hispanico de Petroleos, S.A. (Hispanoil) | 25.00 | Spain | |
| Deutsche Texaco A.G. (Texaco) | 10.00 | United States | |
| Dubai Sun Oil Co. (Sun) | 5.00 | ---- do | |
| Delfzee Dubai Petroleum NV (Wintershall A.G.) | 5.00 | United Kingdom | |
| Sunningdale Oils Ltd | 45.00 | Canada | [2]3,360 |
| Dubai Government | 55.00 | United Arab Emirates | |
| Texas Pacific Dubai Inc. (Distillers Corp.-Seagram Ltd.) | 100.00 | Canada | 1,900 |
| **FUJAIRAH** | | | |
| **Offshore:** Reserve Oil and Gas Co | 100.00 | United States | 2,850 |
| **RAS AL-KHAIMAH** | | | |
| **Onshore:** Norsk Hydro A.S | 100.00 | Norway | 1,700 |
| **Offshore:** | | | |
| Vitol Exploration B.V. operator | 50.00 | Netherlands | NA |
| Weeks Natural Resources Ltd | 50.00 | United Kingdom | |
| **SHARJAH** | | | |
| **Onshore:** | | | |
| Crystal Oil Co. operator | 65.00 | United States | 1,400 |
| Norsk Hydro AS | 30.00 | Norway | |
| Sogedip | 5.00 | France | |
| **Offshore:** | | | |
| Crescent Petroleum Co | -- | -- | 2,020 |
| Buttes Oil and Gas Co. (Buttes) operator | 25.70 | United States | |
| Ashland Oil Co | 25.00 | ---- do | |
| Skelley Oil Co | 25.00 | ---- do | |
| Kerr McGee Corp | 12.50 | ---- do | |
| Cities Service Co | 10.00 | ---- do | |
| Juniper Petroleum Corp. (Buttes) | 1.80 | ---- do | |
| Reserve Oil and Gas Co | 100.00 | ---- do | 1,425 |

See footnotes at end of table.

Table 10.—Concessions held in the United Arab Emirates during 1974—Continued

| Location and company | Ownership (percent) | Nationality of company | Area (square kilometers) |
|---|---|---|---|
| UMM AL-QAIWAIN | | | |
| Offshore: | | | |
| Canadian Superior Oil Ltd. operator | 25.00 | Canada | 555 |
| Asamera Oil Corp., Ltd | 20.00 | do | |
| United Refining Co | 30.00 | United States | |
| Kewanee Oil Co | 10.00 | do | |
| Zapata | 15.00 | do | |
| Occidental Petroleum Corp | 100.00 | do | NA |
| United Refining Co | 100.00 | do | NA |

NA Not available.
[1] ADGLC is to utilize the associated gas from ADMA's concession.
[2] Sunningdale Oils Ltd. is to utilize the associated gas from DPC's concession, but is planning to use only the natural gas liquids at this time.

*Petroleum Exploration.*—The Abu Dhabi Petroleum Co., Ltd. (ADPC) drilled three exploratory wells (table 11) along the coast without finding oil in commercial quantities. Abu Dhabi Phillips Petroleum Co. (Phillips) drilled five exploratory wells, of which one was a potential producer. The Middle East Oil Co., Ltd., a Japanese consortium led by Mitsubishi Oil Co., Ltd. relinquished its onshore concession after spending $25 million drilling 15 unsuccessful exploratory wells. All petroleum companies with concessions offshore Abu Dhabi engaged in seismic surveying except Abu Dhabi Marine Areas Ltd. (ADMA). Three offshore concessionaires drilled a total of five exploratory wells, but Sunningdale Oils Ltd. and Abu Al Bu Koosh Oil Co., Ltd., operated by Compagnie Française des Pétroles (CFP) drilled none.

Texas Pacific Dubai Inc., a subsidiary of Distillers Corp.-Seagrams, Ltd. (Canada), acquired a concession offshore Dubai in September 1974. The agreement called for a $10 million signature bonus and geophysical exploration within the year. There was no exploratory drilling during 1974, although Dubai Petroleum Co. (DPC) operated by Continental Oil Co. (Conoco), ran a crew-month of seismic work (table 11).

Table 11.—Exploration activity in United Arab Emirates, 1974
(Crew-months)

| Emirate and company | Seismic | Gravity | Line-kilometers |
|---|---|---|---|
| Abu Dhabi: | | | |
| Abu Al Bu Koosh Oil Co., Ltd | 0.1 | -- | NA |
| Abu Dhabi Oil Co., Ltd | .1 | -- | 123 |
| Amerada Hess Corp | .5 | -- | NA |
| Sunningdale Oils Ltd | 2.0 | -- | 2,388 |
| Dubai: Dubai Marine Areas Ltd | 1.0 | -- | NA |
| Ajman and Umm al-Qaiwain: United Refining Co | 1.0 | -- | 1,930 |
| Fujairah and Sharjah: Reserve Oil and Gas Co | .5 | 0.5 | NA |
| Ras al-Khaimah: Vitol Exploration BV | NA | -- | 480 |
| Sharjah: Crescent Petroleum Co | .3 | -- | NA |

NA Not available.

Source: American Association of Petroleum Geologists.

Ajman and Umm al-Qaiwain have adjacent offshore areas that are leased to United Refining Co. and claimed by Occidental Petroleum Corp., both of the United States. United Refining Co. completed a seismic survey offshore both emirates. There was no drilling activity in either emirate.

In Fujairah the Reserve Oil and Gas Co. (United States) signed an offshore concession agreement for 2,850 square kilometers and completed seismic and gravity surveys. The company is to drill at least three wells within 4 years.

In early 1974 Sharjah signed an onshore concession agreement with Crystal Oil Co. (United States) which later extended participation to Norsk Hydro A.S. (Norway)

and Sogedip (France). A seismic survey was underway by yearend.

Reserve Oil and Gas Co. signed an offshore concession agreement with Sharjah which obliged the company to drill within 2 years. Reserve Oil and Gas Co. completed a seismic and gravity survey in its interlinked Sharjah and Fujairah concessions during 1974.

Crescent Petroleum Co., with Buttes Oil and Gas Co. (United States) as operator, drilled and abandoned an exploratory well and completed a seismic survey during 1974.

In Ras al-Khaimah, Norsk Hydro A.S. bought the onshore concession that Peninsula Petroleum Co. (United States) had obtained in June 1973. The company was to undertake a seismic survey in late 1974 or early 1975. Offshore Ras al-Khaimah, Vitol Exploration B.V. (Netherlands) sold half interest in its concession to Weeks Natural Resources Ltd. (United Kingdom) and engaged in seismic work. There was no drilling activity.

**Table 12.—Summary of drilling in United Arab Emirates, 1974**

| Emirate and company | Exploratory | Development | Service | Total number of wells drilled | Footage |
|---|---|---|---|---|---|
| Abu Dhabi: | | | | | |
| Abu Al Bu Koosh Oil Co., Ltd | -- | 4 | -- | 4 | e 39,200 |
| Abu Dhabi Marine Areas Ltd | 3 | 12 | [1]9 | 24 | 281,172 |
| Abu Dhabi Oil Co., Ltd | 1 | 3 | -- | 4 | NA |
| Abu Dhabi Petroleum Co., Ltd | 3 | 7 | [2]56 | [3]67 | 507,113 |
| Amerada Hess Corp | 1 | -- | -- | 1 | e 11,160 |
| Phillips Petroleum Co | 5 | -- | -- | 5 | e 45,300 |
| Dubai: Dubai Marine Areas Ltd | -- | 7 | [4]10 | 17 | NA |
| Sharjah: Crescent Petroleum Co | 1 | 7 | [5]12 | 20 | e 208,000 |

e Estimate. NA Not available.
[1] All dump flood wells.
[2] Including 25 water supply wells and 27 water injection wells.
[3] One well abandoned for mechanical reasons.
[4] All water injection wells.
[5] Including 11 water injection wells.

*Petroleum-Development and Production.*—ADPC had five drilling rigs engaged in field development and secondary recovery. The rigs drilled 475,000 feet including 7 development wells, 27 water injection wells, 25 water supply wells, and 4 service wells (table 12). Many of the wells helped complete the power water injection system in the Bab oilfield, which was pumping 260,000 barrels per day of water by yearend 1974. The injection projects for the Asab and Bu Hasa Fields are to be completed during 1975. The Asab oilfield was brought into production during December 1973 and maintained an average monthly production of 360,000 barrels per day during 1974 (table 13). The Bu Hasa and Bab Fields averaged 468,000 and 91,000 barrels per day, respectively.

The Abu Al Bu Koosh Oil Co. started oil production in July 1974, and with the addition of four more development wells, reached a rate of 56,000 barrels per day in December 1974. The Abu Al Bu Koosh oilfield is an extension of Iran's offshore Sasson oilfield.

Table 13.—Oilfields of the United Arab Emirates

| Location and oilfield | Company | Rate of production (average barrels per day) | Reserves (million barrels) | Gravity °API | Sulfur content (percent) |
|---|---|---|---|---|---|
| Abu Dhabi: | | | | | |
| Onshore: | | | | | |
| Asab | Abu Dhabi Petroleum Co., Ltd. | 360,000 | 1,000 | 40 | NA |
| Murban | do | | 2,000 | 39 | 1.0 |
| Bab | do | 91,000 | | | |
| Bu Hasa | do | 468,000 | | | |
| Sahil | do | -- | NA | NA | NA |
| Zarrara | do | -- | NA | 42 | .7 |
| Offshore: | | | | | |
| Abu Al Bu Koosh | Abu Al Bu Koosh Oil Co., Ltd. | 36,000 | 280 | 32 | 1.7 |
| Arzanah | Amerada Hess Corp | -- | NA | 45 | 1.0 |
| El Bunduq | Abu Dhabi Marine Areas Ltd. | -- | 800 | 29 | .1 |
| Mubarraz | Abu Dhabi Oil Co., Ltd | 14,000 | NA | 38 | .8 |
| Umm Shaif | Abu Dhabi Marine Areas Ltd. | 192,000 | 1,800 | 38 | 1.3 |
| Zakum | do | 270,000 | 1,400 | 41 | .9 |
| Dubai: Offshore: | | | | | |
| Fateh | Dubai Marine Areas Ltd | 141,000 | 1,400 | 32 | 1.7 |
| Southwest Fateh | do | 100,000 | 1,000 | 32 | 1.7 |
| Rashid | do | -- | NA | 37–41 | NA |
| Sharjah: Offshore: | | | | | |
| Mubarek | Crescent Petroleum Co | 23,000 | NA | 40 | .6 |

NA Not available.

ADMA started work on a $750 million waterflood secondary recovery project which would increase production from 462,000 barrels per day in late 1974 to 880,000 barrels per day in late 1975, and to as much as 1.2 million barrels per day by 1980. This would involve the injection of 1 million and eventually 2.5 million barrels per day of processed seawater. ADMA estimates about 10% of the total oil in place has been recovered, and the waterflood should allow an ultimate recovery of 30% to 35% of the original oil in place. Drilling by 6 jack-up rigs included 10 wells in the Umm Shaif Field and 11 wells in the Zakum Field. Nine of the 21 wells were dump flood wells which will later be turned into power-injection wells. The El Bunduq Field was also being readied for production and connected to processing and terminal facilities on Das Island.

Abu Dhabi Oil Co., Ltd. (ADOC) has spent $130 million on developing the offshore Mubarraz Field.

In Dubai the Dubai Petroleum Corp. (DPC) continued development of the Fateh and Southwest Fateh Fields with a $200 million program of development drilling and secondary recovery designed to raise production to 400,000 barrels per day during 1975. Over $85 million was spent on the Fateh Field waterflood project finished during 1974, and another $25 million was spent on a gas-lift project nearing completion in the southwest Fateh.

Most Crescent Petroleum Co.'s drilling was for development (7 wells) and water injection (11 wells) in the Mubarek oilfield, which started production in July after the expenditure of $60 million. This field is 14.5 kilometers southeast of Abu Musa Island in 63 meters of water. The pay zones are in the Middle Cretaceous Mishriff and Upper Cretaceous Ilam zones at a depth of 3,800 to 3,960 meters. Significant quantities of associated gas are also present.

Currently oil produced in the Mubarek Field is pumped into a 640,000-barrel storage vessel *Baraka I* and offloaded into the tankers of Ashland Oil Inc., Skelly Oil Co., Kerr-McGee Corp. and Cities Service Co. The maximum production capacity is limited to 100,000 barrels per day by the storage and support complex. Sharjah has made arrangements with Iran and Umm al-Qaiwain concerning conflicting border claims. Iran and Sharjah will share oil royalties equally.

*Petroleum Refining.*—In Abu Dhabi construction of a 15,000-barrel-per-day refinery started in early 1974. ADPC expects to complete this refinery at Umm

al-Nar Island during 1975. Crude petroleum will be separated into light and heavy fractions at Habskan, and the light oil will then be piped to Umm al-Nar Island by a new 122-kilometer 8-inch pipeline. The Kellogg Co. (United States) received a $35 million contract for refinery design and construction, while the Pan-Arabian Co. is charged with laying the 3,000 tons of pipe. The refinery will supply gasoline and liquefied petroleum gas for local consumption.

In Dubai construction of a 200,000-barrel-per-day export refinery was under consideration, but no contracts were awarded by yearend.

*Petroleum Trade.*—Mineral trade consisted primarily of crude oil exports, and imports of refined petroleum products and construction materials. Abu Dhabi earned $3.5 billion from oil exports, while Dubai and Sharjah together earned nearly $700 million from oil exports. Five countries received 80% of petroleum exports from the United Arab Emirates. They were Japan (33.0%), France (21.1%), the United Kingdom (9.4%), the United States (8.5%), and West Germany (8.0%). During 1974 the Emirates imported 450,353 tons of processed petroleum products from Iran (58%), Kuwait (24%), and other Persian Gulf countries. The imported products were motor gasoline (1,196,000 barrels), distillate fuel oil (1,031,000 barrels), jet fuel and kerosine (804,000 barrels), and residual fuel oil (462,000 barrels).

A further expansion of Port Rashid is planned costing around $150 million. The project involves constructing over 5 kilometers of breakwaters which will enclose 3.9 square kilometers. The harbor will be dredged to a minimum depth of 11.5 meters, providing almost a square kilometer of new land and 22 new cargo berths. Sir William Halcrow and Partners, Ltd. (United Kingdom), the consulting engineers, will invite contract proposals. This port expansion is in addition to the Dubai Drydock Co.'s project for two 500,000 deadweight ton and one 1,000,000-deadweight-ton capacity drydocks.

Sharjah signed a contract with three civil engineering firms—Archirodon S.A. (Greece), Hochtief A.G. (West Germany), and Six Construct (Belgium)—for construction of a deepwater harbor in the existing Sharjah Creek. Sir William Halcrow and Partners, Ltd. are to be the consulting engineers for the project, which is expected to cost $48 million and eventually to provide six deepwater berths. Over 4 kilometers of breakwaters and sea wall will be built in addition to substantial dredging within the harbor and its approaches. Financing will be provided by Citicorp International Bank Ltd. (United Kingdom), European Arab Bank (Belgium), Chartered Bank (United Kingdom), and Sharjah.

**Table 14.—Abu Dhabi: Exports of crude oil by destination**
(Thousand 42-gallon barrels)

| Country | 1972 | 1973 | 1974 |
|---|---|---|---|
| Canada | 11,936 | 9,052 | 6,314 |
| France | 80,336 | 97,200 | 112,530 |
| Germany, West | 15,586 | 20,148 | 33,762 |
| Italy | 15,294 | 21,718 | 9,964 |
| Japan | 97,784 | 174,470 | 189,143 |
| Netherlands | 29,346 | 21,973 | 16,571 |
| United Kingdom | 61,138 | 53,728 | 44,384 |
| United States | 41,354 | 42,304 | 44,712 |
| Other | 30,403 | 31,498 | 61,102 |
| Total | 383,177 | 472,091 | 518,482 |

Source: Organization of the Petroleum Exporting Countries, Statistics Unit. Annual Statistical Bulletin 1974. Vienna 1975, p. 72.

## YEMEN ARAB REPUBLIC [13]

The mineral industry of the Yemen Arab Republic is based on the extraction and processing of several nonmetallic minerals and the manufacture of cement. Most of the nonmetallic minerals, including building stone, limestone, and gypsum, are mined for local consumption; however, rock salt has been mined at Salif in com-

[13] Prepared by Bernadette Michalski.

mercial quantities for export. Exports approached 74,000 tons in fiscal year (FY) 1972; dipped to 800 tons in FY 1973 and were discontinued in FY 1974, while expansion activities in the Salif Harbor area prevented normal shipping operations. Harbor expansion was planned and implemented by Canadian firms with financing available from the Kuwait Fund for Arab Economic Development. New facilities at Salif include a 250-meter concrete pier which can accommodate vessels up to 50,000 deadweight tons, and a conveyor system capable of loading 1,000 tons of salt hourly. The new port facilities will be available in late 1975, and rock salt exports will resume as markets are established. Salt reserves at Salif have been estimated at 25 million tons, affording the Yemen Arab Republic an excellent opportunity to improve its balance of payments position.

Cement production was inaugurated in the Yemen Arab Republic with commissioning of the Bajil cement plant in 1972. By September 1974 plans were discussed to expand plant capacity from 50,000 tons per year to 100,000 tons per year. The construction of a second cement plant was to be financed by Libya; plant capacity would be 1.5 million tons per year. By yearend no fixed contracts were announced for either project.

Three offshore exploration and development concessions were awarded in 1974. Royal Dutch/Shell conducted seismic surveys in its 10,000-square-kilometer concession in the Red Sea off the Yemen Arab Republic, and just south of the Shell concession seismic surveys were conducted by Santa Fe Minerals, Inc., a subsidiary of Santa Fe International Corp. (United States) and Toyo Menkakaisha Ltd. (Japan). The Santa Fe group announced that exploratory drilling in their concession area was expected in the spring of 1975. At yearend the Libyan National Oil Co. entered a concession agreement covering the southern portion of the Yemeni Continental Shelf.

Domestic petroleum product requirements are met entirely through imports. The procurement and distribution of all petroleum products is under the auspices of the Yemen National Petroleum Co. (YNPC). Product imports are obtained from the Aden refinery in the People's Democratic Republic of Yemen, for lubricants which are obtained from Kenya. Imports are estimated as follows, in thousand barrels:

| Product | 1973 | 1974 |
|---|---|---|
| Motor and aviation gasoline | 410 | 544 |
| Kerosine | 284 | 342 |
| Jet fuel | 31 | 44 |
| Diesel oil | 623 | 783 |
| Fuel oil | 146 | 403 |

Petroleum products are delivered by coastal tankers to the port of Hodeida where limited port facilities can accommodate only vessels of 4,000 deadweight tons or less. In mid-1974 expansion activities at Hodeida were underway; however, the developing port of Salif may eventually be the chief petroleum product import center. Expansion and construction of petroleum product storage facilities at Salif, Hodeida, Sana, and Mocha were also underway in 1974, raising storage capacity from its present level of 125,000 barrels to an eventual level of 600,000 barrels.

# The Mineral Industry of Other Areas of the Far East and South Asia

By Staff, Bureau of Mines

## CONTENTS



## AFGHANISTAN [1]

In 1974 Afghanistan reported increases in production of hydraulic cement, coal, natural gas, and salt. Production of barite and talc was reported for the first time. Table 1 summarizes the production totals for each commodity. Natural gas was the primary mineral commodity extracted in Afghanistan in 1974. Exports of natural gas, primarily to the U.S.S.R., reached 2.8 billion cubic meters worth about $20 million. The Department of Petroleum Exploration announced plans to exploit about 30 billion cubic meters of sour gas from the Jerqodaq Fields. The new facilities are to include the construction of a 2-billion-cubic-meter storage facility, drilling of 44 wells to depths of 2,200 meters each, pipelines, and a refinery. Construction is expected to be completed in 1976. The project is financed partly by the U.S.S.R.

Natural gas from Khowaja Gogirdak Fields was used for production of power and fertilizer. More than 18,600 tons of urea fertilizer was produced at the Mazari Sharif chemical fertilizer factory in 1974. The capacity of this plant was reported to be 105,000 tons.

Barite mines increased production in the Farinjal area of Ghorband and in the Sanlon area of Herat. The barite in the Herat region contains about 85% barium sulfate. The Farinjal deposits are estimated to contain 52,000 tons and the Herat reserves are said to total more than 1.4 million tons. The Farinjal barite is used primarily in the northern regions of Afghanistan in oil and gas exploration well drilling. The Herat barite is being used in the paint industry because of its higher barium sulfate content. In September, an agreement was signed with the U.S.S.R. for the export of 10,000 tons of unprocessed barite.

Talc production targets were set at 20,000 tons per year from deposits in Shinwar and Nangarhar. Reserves of talc in these two mines are estimated to be 170,000 tons. Other mineral commodities showing promise are gold, copper, and fluorite Copper reserves near Ainak are estimated to total 1 million tons with a copper content of 1% to 2%. Fluorite reserves in Bakhoot Orizgone are 1 million tons including 300,000 tons of pure fluorite.

[1] Prepared by Stanley K. Haines, physical scientist, Division of Nonmetallic Minerals.

## Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities

| Area,[1] commodity, and unit of measure | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **AFGHANISTAN [2 3]** | | | |
| Barite ---- thousand metric tons | -- | e 5 | 10 |
| Cement, hydraulic ---- do | 99 | 141 | 146 |
| Coal, bituminous ---- do | 130 | 114 | 153 |
| Fuel briquets (produced from a portion of domestically mined coal) ---- do | NA | 10 | NA |
| Gas, natural, marketed production ---- million cubic feet | 102,200 | 96,585 | 102,412 |
| Gem stones, lapis lazuli ---- kilograms | e 10,000 | e 10,000 | 8,500 |
| Natural gas liquids ---- thousand 42-gallon barrels | e 12 | 13 | e 15 |
| Salt, all types ---- thousand metric tons | 31 | 38 | 51 |
| Stone, marble "traso" ---- thousand square meters | NA | 57 | NA |
| Talc ---- do | -- | -- | 3 |
| **BANGLADESH [2]** | | | |
| Cement, hydraulic ---- thousand metric tons | r 27 | 30 | 87 |
| Clays, kaolin (china clay) ---- metric tons | e 2,000 | 6,096 | 1,200 |
| Fertilizer materials, manufactured: [4] | | | |
| Gross weight [e] ---- thousand metric tons | r 45 | 198 | 227 |
| Nitrogen content ---- do | r 21 | 92 | 129 |
| Gas, natural, marketed production [5] ---- million cubic feet | 26,000 | 32,000 | 17,223 |
| Iron and steel: | | | |
| Crude steel ---- thousand metric tons | e 41 | 61 | 81 |
| Mild steel products ---- do | r 105 | 128 | 140 |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels | r 388 | 260 | 369 |
| Jet fuel ---- do | 73 | -- | 105 |
| Kerosine ---- do | r 1,267 | 613 | 782 |
| Distillate fuel oil ---- do | 763 | 574 | 522 |
| Residual fuel oil ---- do | r 2,291 | 1,656 | 1,424 |
| Other: | | | |
| Naphtha ---- do | 314 | 223 | 81 |
| Unspecified ---- do | 300 | 184 | 269 |
| Refinery fuel and losses ---- do | 458 | 423 | 281 |
| Total ---- do | r 5,854 | 3,933 | 3,833 |
| Salt, marine ---- thousand metric tons | e 315 | e 757 | 169 |
| Stone, limestone, industrial ---- do | r e 58 | 64 | 81 |
| **BRUNEI [2]** | | | |
| Gas, natural: | | | |
| Gross production ---- million cubic feet | r e 170,000 | e 220,000 | 243,811 |
| Marketed production ---- do | r 15,997 | e 170,000 | 176,820 |
| Natural gas liquids: | | | |
| Condensate ---- thousand 42-gallon barrels | 149 | 1,253 | 2,083 |
| Natural gasoline ---- do | 430 | 420 | 431 |
| Liquefied petroleum gas ---- do | 178 | 180 | 186 |
| Total ---- do | 757 | 1,853 | 2,700 |
| Petroleum: | | | |
| Crude ---- do | 67,008 | 78,673 | 70,338 |
| Refinery products: | | | |
| Gasoline ---- do | r e 112 | 133 | 119 |
| Distillate fuel oil ---- do | r e 196 | 203 | 238 |
| Residual fuel oil ---- do | r e 6 | 1 | 1 |
| Other ---- do | r e 20 | 38 | 46 |
| Refinery fuel and losses ---- do | e 32 | -- | —1 |
| Total ---- do | r e 366 | 375 | 403 |
| **HONG KONG [2]** | | | |
| Cement, hydraulic ---- thousand metric tons | 408 | 441 | 571 |
| Clays, kaolin ---- metric tons | 3,162 | 6,753 | 3,320 |
| Feldspar ---- do | 1,149 | 1,340 | 5,566 |
| Iron ore and concentrate, gross weight ---- do | r 162,283 | 150,713 | 159,737 |
| Quartz ---- do | 3,631 | 991 | 351 |
| **KHMER REPUBLIC [2]** | | | |
| Cement, hydraulic ---- thousand metric tons | r 99 | 78 | e 100 |
| Gem stones: | | | |
| Amethyst ---- thousand carats | 72 | NA | NA |
| Ruby ---- do | 446 | NA | NA |
| Sapphire ---- do | 275 | NA | NA |
| Zircon ---- do | 32 | NA | NA |
| Gold, mine output, metal content [e] ---- troy ounces | 4,000 | 4,000 | 4,000 |
| Salt ---- metric tons | 36,300 | 31,000 | e 31,000 |
| Sand, silica ---- do | 2,900 | NA | NA |

See footnotes at end of table.

## Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities—Continued

| Area,[1] commodity, and unit of measure | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **LAOS [2]** | | | |
| Salt, rock ---- metric tons -- | 7,776 | 8,640 | 9,600 |
| Tin: | | | |
| Mine output, metal content ---- long tons -- | e r 570 | e r 550 | 585 |
| Metal, smelter e ---- do ---- | r 520 | r 500 | 530 |
| **MONGOLIA [2]** | | | |
| Cement, hydraulic ---- thousand metric tons -- | 141 | 146 | e 150 |
| Coal: | | | |
| Anthracite and bituminous ---- do ---- | 106 | 118 | e 125 |
| Lignite and brown ---- do ---- | 2,147 | 2,206 | e 2,300 |
| Total ---- do ---- | 2,253 | 2,324 | e 2,425 |
| Fluorspar, all grades e ---- metric tons -- | 100,000 | 240,000 | 240,000 |
| Gypsum e ---- do ---- | 25,000 | 25,000 | 25,000 |
| Lime, quicklime and hydrated e ---- do ---- | 40,000 | 40,000 | 40,000 |
| Petroleum refinery products: [6] | | | |
| Kerosine e ---- thousand 42-gallon barrels -- | 23 | 23 | 25 |
| Residual fuel oil e ---- do ---- | r 13 | r 23 | 25 |
| Total of listed figures e ---- do ---- | r 36 | r 46 | 50 |
| Salt ---- metric tons -- | 10,000 | 11,000 | e 11,000 |
| **SINGAPORE [2]** | | | |
| Cement, hydraulic ---- thousand metric tons -- | 1,009 | 1,028 | e 1,052 |
| Iron and steel: | | | |
| Crude steel ---- do ---- | 190 | 204 | e 220 |
| Semimanufactures (rolled only) ---- do ---- | 194 | 302 | NA |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels -- | r 19,626 | 18,374 | 28,299 |
| Jet fuel ---- do ---- | 28,251 | 30,729 | 21,525 |
| Kerosine ---- do ---- | 9,435 | 13,604 | 4,583 |
| Distillate fuel oil ---- do ---- | 32,434 | 37,724 | 32,280 |
| Residual fuel oil ---- do ---- | 76,891 | 76,133 | 53,665 |
| Lubricants ---- do ---- | 795 | 2,375 | 1,642 |
| Other ---- do ---- | 7,236 | 10,452 | 8,261 |
| Refinery fuel and losses ---- do ---- | r 13,290 | 4,416 | 6,433 |
| Total ---- do ---- | r 187,958 | 193,807 | 156,688 |
| Stone, granite, broken ---- thousand cubic meters -- | r 1,823 | 1,778 | 1,795 |
| Sulfur, byproduct from oil refining ---- metric tons -- | 5,612 | e 6,000 | e 6,000 |
| **SRI LANKA** | | | |
| Cement, hydraulic ---- thousand metric tons -- | 383 | 422 | 453 |
| Clays: | | | |
| Ball ---- metric tons -- | -- | 1,090 | NA |
| Kaolin ---- do ---- | 3,946 | 13,881 | 5,888 |
| Other [7] ---- do ---- | 70,162 | NA | NA |
| Coke, gashouse ---- thousand metric tons -- | r 8 | 7 | e 7 |
| Feldspar, crude and ground ---- metric tons -- | 579 | 625 | 779 |
| Garnet, not further described ---- do ---- | 14 | -- | -- |
| Gem stones, precious and semiprecious, except diamond ---- thousand carats -- | 179 | 478 | NA |
| Graphite, all grades ---- metric tons -- | 6,156 | 6,208 | e 9,447 |
| Mica, scrap ---- do ---- | 194 | 272 | 180 |
| Petroleum refinery products: | | | |
| Gasoline ---- thousand 42-gallon barrels -- | r 2,157 | 1,041 | 829 |
| Jet fuel ---- do ---- | r 321 | 326 | 454 |
| Kerosine ---- do ---- | r 1,971 | 1,954 | 1,572 |
| Distillate fuel oil ---- do ---- | r 3,075 | 3,035 | 2,670 |
| Residual fuel oil ---- do ---- | r 4,612 | 4,452 | 3,964 |
| Other ---- do ---- | r 218 | 1,293 | 1,059 |
| Refinery fuel and losses ---- do ---- | r 790 | 889 | 709 |
| Total ---- do ---- | r 13,144 | 12,990 | 11,257 |
| Rare-earth minerals, monazite concentrate, gross weight ---- metric tons -- | -- | -- | 6 |
| Salt, marine ---- do ---- | r 157,679 | 123,099 | 120,287 |
| Sand and gravel, glass sand ---- do ---- | 188 | NA | 43 |
| Stone: | | | |
| Dolomite ---- do ---- | 2,800 | 6,102 | NA |
| Limestone ---- thousand metric tons -- | 592 | 697 | 784 |
| Quartz, massive ---- metric tons -- | 1,657 | 434 | 305 |
| Titanium: | | | |
| Ilmenite concentrate, gross weight ---- do ---- | 82,503 | 93,482 | 81,098 |
| Rutile concentrate, gross weight ---- do ---- | 2,151 | 2,252 | 3,051 |
| Zirconium concentrate, zircon, gross weight ---- do ---- | 30 | 28 | 21 |

See footnotes at end of table.

## Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities—Continued

| Area,[1] commodity, and unit of measure | 1972 | 1973 | 1974 [p] |
|---|---|---|---|
| **VIETNAM, NORTH [9]** | | | |
| Cement, hydraulic [e] thousand metric tons | 250 | 500 | 600 |
| Coal, anthracite [e] do | 2,000 | 3,000 | 4,000 |
| Fertilizer materials, crude, phosphatic, phosphate rock [e] do | 280 | 500 | 1,200 |
| Salt [e] do | 150 | 150 | 150 |
| Tin: | | | |
| Mine output [e] long tons | [r] 190 | 190 | 240 |
| Smelter output [10] do | [r] 150 | 150 | 190 |
| **VIETNAM, SOUTH** | | | |
| Cement, hydraulic thousand metric tons | 243 | 265 | 294 |
| Clays: | | | |
| Kaolin [e 11] metric tons | 1,000 | 1,000 | 1,000 |
| Lateritic thousand cubic meters | 400 | 394 | NA |
| Other do | 795 | [e] 836 | NA |
| Gypsum [e] metric tons | 7,000 | 7,000 | 7,000 |
| Salt, marine thousand metric tons | 192 | 200 | [e] 200 |
| Sand and gravel: | | | |
| Silica sand [e] thousand cubic meters | 195 | 195 | NA |
| Other sand and gravel [e] do | 1,095 | 1,085 | NA |
| Stone: [12] | | | |
| Basalt, rhyolite do | 22 | 22 | NA |
| Granite and porphyry [e] do | 433 | 433 | NA |
| Limestone do | 1,395 | 1,550 | NA |
| Sandstone thousand metric tons | 100 | [e] 100 | NA |
| Schist thousand cubic meters | 60 | [e] 80 | NA |
| Quartz do | 1 | 1 | NA |

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the countries listed individually in this table, Nepal, covered textually in this chapter, presumably produces a variety of crude construction materials such as clays, stone, sand, gravel, and may produce cement, but production statistics are not available, and general information is inadequate to make reliable estimates of output levels.

[2] In addition to the commodities listed, a variety of crude construction materials such as clays, stone, sand, and gravel presumably were produced, but production statistics are not available and general information is inadequate to make reliable estimates of output levels.

[3] Data for years beginning March 21 of that stated.

[4] For the year ended June 30 of that stated.

[5] Gross production not reported. Marketed output is reported in lieu of gross production estimate because the quantity flared, vented, and/or reinjected is believed to be small.

[6] Source for 1972 and 1973 data: Statistical Office of the United Nations, World Energy Supplies 1970–73, Series J, No. 18. Previous editions of this publication showed output of gasoline and distillate fuel oil, but these listings have been discontinued and figures for kerosine and residual fuel oil that previously were shown as reported figures have been labeled as estimates.

[7] For cement production only.

[8] Exports.

[9] In addition to the commodities listed, chromite, iron ore, and lead-zinc ores were mined in the past and the country produced pig iron, crude steel, and smelter zinc from its industrial facilities, but the status of these industries under prevailing conditions is not sufficiently clear to permit preparation of reliable estimates of output. Similarly, no data on crude construction materials is available and no reliable basis for estimation is available.

[10] From official import statistics of the U.S.S.R.

[11] The South Vietnam Directorate of Natural Resources estimates a kaolin production level of 420,000 cubic meters annually for the years 1972–73, but the figure is inordinately high for true marketable china clay grade kaolin. No such estimate was made for 1974.

[12] Additional varieties of stone presumably are produced, but production statistics are not available, and general information is inadequate to make reliable estimates of output levels.

## Table 2.—Afghanistan: Imports of petroleum refinery products

(Thousand 42-gallon barrels)

| Commodity | 1971 | 1972 [e 1] | 1973 [e] |
|---|---|---|---|
| Gasoline, all grades | [2] 969 | [r] 1,020 | 1,100 |
| Jet fuel and kerosine | [2] 31 | [r] 47 | 50 |
| Distillate fuel oil | [2] 684 | [r] 550 | 650 |
| Residual fuel oil | | [r] 225 | 250 |
| Lubricants | [e] 36 | 38 | 40 |
| Other | [e] 44 | [r] 50 | 60 |
| Total | 1,764 | [r] 1,930 | 2,150 |

[e] Estimate. [r] Revised.

[1] Estimates revised to conform with 1971 reported figures and 1972 estimates published in source cited in footnote 2.

[2] Figures reported by Statistical Office of the United Nations, World Energy Supplies, 1969–72. Statistical Papers, Series J. No. 17, New York, 1974, 195 pp.

## BANGLADESH [2]

The mineral industries in Bangladesh had a mixed year in 1974. Production of crude steel, mild steel products, hydraulic cement, and limestone increased over 1973 levels. Kaolin (china clay), natural gas, and salt production decreased. Table 1 summarizes the statistical data for mineral production in Bangladesh.

The gasfields at Rashipar, Kalas Tila, Titas, Bakhrabad, Habiganj, Haripur, and Chhatak were estimated to contain 8.29 trillion cubic feet of reserves with total resources of 20 trillion cubic feet. Hydrocarbon content of the gas was said to be over 95% regardless of producing field, allowing the gas to be used as either fuel or feedstock. The low sulfur content makes the gas well suited for home heating purposes. As a feedstock the gas was used to produce fertilizers and petrochemicals. Current consumption of gas was estimated to be 60 million cubic feet per day. Of this total an estimated 35 million cubic feet was processed into fertilizer, 20 million cubic feet for power, and 5 million cubic feet for industrial, commercial, and domestic uses.

Offshore areas of Bangladesh were considered to contain considerable quantities of oil. In October 1974 Bangladesh signed contracts with six foreign oil companies for the exploration for oil of 30,000 square miles in the Bay of Bengal. The companies were Atlantic Richfield Co., Ashland Oil Inc., Union Oil Co. of California, Canadian Superior Oil Ltd., Ina Naftaplin (Yugoslavia), and the Japan Petroleum Development Corporation. The Soviet Union was exploring for oil and gas in a number of onshore locations.

Bangladesh's coal requirements were estimated at 2 million tons per year with India providing the bulk of imports. India was to supply 660,000 tons of noncoking coal to Bangladesh by March 1974.

## BRUNEI [3]

A mineral economy based on petroleum and natural gas proved highly beneficial to Brunei in 1974 as rising prices raised the country's earnings to a level nearly triple that of 1973. Even a slight decline in petroleum output failed to slow the upsurge of oil revenues, and the rising receipts accruing from liquefied natural gas (LNG) sales further swelled the flow of income. In fact, the sudden influx of wealth left the country in somewhat of a quandry as to its disposition in a world of rapid inflation and fluctuating currencies.[4]

Attempts to diversify the economy, which obtains over 90% of its income from oil and gas production, were spelled out in the National Development Plan covering the period 1975–79. Goals of the plan include diversification of agriculture, development of infrastructure, and encouragement of foreign investment in agriculture, mining, and manufacturing, partly in order to make more skilled jobs available. In line with these goals, a Japanese consortium announced plans to build a large pulp and paper plant, and investors from other countries were showing interest in proposals to develop fertilizer, glass, ceramic, and petrochemical industries.[5] Efforts to achieve a wider distribution of the country's wealth among its population were being made.[6]

Development activity in connection with the country's present mineral industries during the year was limited to expansion of offshore petroleum production facilities and completion of the final liquefaction train for the LNG plant. No new petroleum or natural gasfields were discovered, and plans for a new oil refinery did not proceed beyond the discussion stage.

### PRODUCTION AND TRADE

Petroleum and natural gas continued to be Brunei's only mineral products in 1974, but they were sufficient to provide the country with a very sizable increase in

[2] Prepared by Stanley K. Haines.
[3] Prepared by David G. Willard, economist, Division of Nonmetallic Minerals.
[4] Far Eastern Economic Review. A Healthy Surplus for Brunei. V. 87, No. 3, Jan. 17, 1975, pp. 62–63.
[5] Far Eastern Economic Review. Japanese Finance for Big Brunei Venture. V. 86, No. 51, Dec. 27, 1974, p. 51.
Hong Kong and Shanghai Banking Corp. The Chairman's International Survey for the Year 1974. Far Eastern Economic Review, v. 88, No. 18, May 2, 1975, p. 47.
[6] Tilak, S. J. The High Cost of a Bright Future. Far Eastern Economic Review, v. 88, No. 19, May 9, 1975, p. 25.

revenue. The total value of Brunei's 1974 mineral production was $886 million, almost three times the 1973 value of $321 million.

Output of crude petroleum declined by 11% in 1974 to 70,338,000 barrels from 78,673,000 barrels in 1973. A well blowout and reduced demand were responsible for the decrease.[7] However, the extreme rise in crude oil prices during the year pushed the value of petroleum up by 166%, from $308 million in 1973 to $819 million in 1974. Gross natural gas production increased strongly to 244 billion cubic feet in 1974 from 220 billion cubic feet in 1973. Marketed natural gas production was up 4% from the 1973 level, but exceeded the 1972 level by 1,105%. Marketed production represented 73% of gross production in 1974 as compared with 9% in 1972. The change reflected the market outlet provided by the LNG plant, for most of the gas, which is produced in association with petroleum, previously could not be utilized. A sharp rise in gas prices, added to the increase in marketed production, boosted the value of natural gas output to $32 million in 1974.

Output levels of both natural gas liquids and petroleum refinery products were also higher than that of 1973, and their values reflected the price increases of the parent materials.

Petroleum and natural gas continued to dominate Brunei's trade picture, accounting for 96% of the total value of exports. The country's export earnings in 1974 were almost three times greater than the 1973 earnings. Sales of LNG amounted to 10% of export earnings in 1974, the first year in which the new industry made a significant contribution to the country's economy. The increase in oil and gas prices assured that Brunei's balance of trade would swing into the favorable side, as export earnings were more than six times greater than expenditures on imports.[8]

Detailed trade data for 1973 and 1974 were not available at the time that this chapter was written. The latest trade statistics available are those for 1971 and 1972, and are contained in the 1973 Minerals Yearbook chapter.

### COMMODITY REVIEW

**Natural gas.**—The fifth and final liquefaction train was installed in the LNG plant during 1974. The entire plant was operating but was not scheduled to reach full capacity until 1976. A fourth tanker was commissioned in 1974, and three more were on order to complete the fleet of seven specialized carriers which will transport the LNG to Japan. No further expansion plans were announced, although the addition of more capacity may be a possibility in the future.[9]

**Petroleum.**—Production is scheduled to be expanded at Shell Oil Co.'s offshore Southwest Ampa Field in 1975 with the addition of two new platforms housing nine 30,000-barrel-per-day production units. Onshore storage is to be doubled to 3 million barrels by the construction of three 470,000-barrel tanks, scheduled to be completed in early 1975.[10]

No new oil or gasfields were discovered in 1974, and there was a slackening in exploration activity. Shell, the only producer, limited its drilling activity to development wells. Two consortiums—one consisting of Sun Oil Co., Clark Oil Co., and Superior Oil Co. and the other including Ashland Oil, Woods Petroleum Corp., and Pennzoil International—have been conducting exploration programs both offshore and onshore but so far without success.

Plans for a new oil refinery at Lumut remained in the discussion state, and no start was made on construction.

## HONG KONG [11]

Hong Kong lives by trade, and its economy was therefore highly vulnerable to adverse economic currents which swept the world in 1974. Declining orders from its industrialized customers and inflated costs for its raw materials, fuels, and consumption imports tested the ability of the local business community to adapt to and survive in an unfavorable environment. Some enterprises failed the test, but the colony's economy as a whole emerged intact and in a relatively good position to take advantage of any improved opportunities that 1975 might bring.

[7] Hong Kong and Shanghai Banking Corp. The Chairman's International Survey for the Year 1974. Far Eastern Economic Review, v. 88, No. 18, May 2, 1975, p. 47.
[8] Work cited in footnotes 4 and 7.
[9] Work cited in footnote 7.
[10] Petroleum Economist. News in Brief. V. 41, No. 5, May 1974, p. 195.
[11] Prepared by David G. Willard.

A decline in the volume of exports and a slight widening of the unfavorable balance of trade were the principal causes of Hong Kong's economic distress. Behind the drop in exports lay economic recessions in industrialized nations, triggered by the previous yearend's petroleum shortage and high oil prices. The same cause held the number of tourists visiting Hong Kong to the 1973 level, in contrast to a 17% average per year growth rate in the previous decade. Prices for most primary products increased in excess of those for manufactured goods, causing the unfavorable shift in the trade balance. The outcome for Hong Kong was zero growth in the gross domestic product (GDP), an increase in unemployment and underemployment, a deficit government budget, and declining construction activity.

In Hong Kong's basically free enterprise economic environment, a large share of the impact fell upon labor with the result that pressure for wage increases was sharply reduced from that in previous years. That factor and the success of entrepreneurs in lowering other costs brought a drop in the rate of inflation later in the year, leaving Hong Kong in a good competitive position to take advantage of any recovery in world markets in 1975.[12]

The small mining industry was unaffected as a whole by the economic slump, but its sectors fared variously. Production of iron ore and feldspar were both up while kaolin and quartz output fell. Cement production increased, mostly as the result of projects began the year before.

The metals processing industry also experienced the general economic slump. A net decline of 31 brought the number of companies in the industry down to 211 in 1974 from 242 in 1973. Employment fell by 5% to an average of 2,892 from 3,058 the year before. The situation would have been worse had not higher costs of imported products allowed the local industry to capture a greater share of the Hong Kong market.[13]

Fortunately for Hong Kong, the governmental machinery setup to deal with the petroleum crisis went largely unused. Controls on the distribution of oil were never put into effect, and the only restriction that occurred was a curfew on advertising lights. Chief among the factors bringing about this outcome was the willingness of the People's Republic of China to provide petroleum, for which the Hong Kong Government set aside land for construction of storage facilities. Other factors included government measures to discourage private car use (more for reasons of congestion than fuel conservation), a cutback in electric power reserves and publicity efforts. The historic trends of increasing petroleum imports and conversion from coal to oil continued, although at reduced rates.[14]

Budget deficits forced the Government to delay portions of its public works programs during the year, but below average rainfall gave further impetus to the three major water supply projects. Since Hong Kong has no rivers of consequence, all water supplies must currently be obtained from stored runoff until the desalination project is completed. All civil engineering work was completed in connection with raising the dams on Plover Cove reservoir, and construction continued on appurtenant facilities. The dry summer enabled good progress to be made on construction of dams for the High Island complex. Delays in the manufacture in Japan of equipment for the Castle Peak desalting plant, caused by the fuel crisis, forced a rescheduling of completion dates for that project.[15] Looking further into the future, the Government completed feasibility studies for a second desalter, and the possibility of a nuclear powerplant was under discussion.[16]

The Government, in its effort to reduce projected budget deficits, proposed a tax revision package as part of its 1975–76 budget. Included were a 1-year increase in the company profits tax from 15% to 16.5%, a dividend-withholding tax (to take effect in the 1976–77 fiscal year), and higher property tax rates.[17] Another legislative proposal was a labor relations bill containing a provision which allows the Governor to halt a strike by declaring a cooling-off period.[18]

Trade negotiations with the United States and the European Economic Community (EEC) failed to provide any hope

[12] U.S. Consulate, Hong Kong. State Department Airgram A-99, May 9, 1975.
[13] Hong Kong Government. Hong Kong 1975. February 1975, pp. 11, 232.
[14] U.S. Consulate, Hong Kong. State Department Telegrams 1577, February 1974, and 4825, May 1975.
[15] Page 127 of work cited in footnote 13.
[16] Aston, T. W. Hong Kong—Shop Window and Market Place of the Far East. Trade and Industry, v. 15, No. 8, May 23, 1974, p. 393.
[17] Bowring, Philip. Radical Implications for Hong Kong. Far Eastern Economic Review, v. 87, No. 10, Mar. 7, 1975, pp. 34–35.
[18] Lipsky, Seth. Hong Kong Workers Wary of Legislation. Far Eastern Economic Review, v. 88, No. 14, Apr. 4, 1975, p. 55.

for immediate improvement in Hong Kong's market situation. The U.S. Government excluded Hong Kong from its list of developing countries to be granted concessions on exports to the United States under the generalized system of preferences which is to come into effect late in 1975. Hong Kong remained off the list due to its industrial capability, but many of its competitors were included on the list.[19] The EEC offered only minor adjustments in its generalized system of preferences (in which Hong Kong is included) because of the currently depressed economic condition of many EEC members.[20]

## PRODUCTON AND TRADE

Mineral production trends in Hong Kong were mixed in 1975, and the net outcome was not greatly changed from that in 1974. Prices of Hong Kong's commodities increased only slightly in contrast to the inflationary price rises of many world minerals. Mining remained a minor contributor to Hong Kong's GDP.

Output of iron ore was up during the year, and feldspar production also increased. Lower output levels were recorded for both kaolin and quartz. Production of cement continued on an uptrend despite a reduction in Hong Kong's overall level of construction activity. Total value of Hong Kong's mineral output, excluding cement, remained at $1.3 million in 1974, unchanged from 1973 output.

Hong Kong's trade mirrored the colony's economic fluctuations during 1974. Exports and imports both rose sharply in value but declined in volume. Exports gained 18% in value to $4.5 billion but fell off 7% in volume, while import value, at $6.8 billion, was up 18%, but import volume declined 4%. Reexports fared worse than domestic exports, growing only 9% in value to $1.4 billion, far below the 57% increase in 1973, causing many to be concerned about the future of Hong Kong's entrepôt trade. The colony's terms of trade worsened slightly as export coverage of imports fell to 88% from 90% in 1973, but the trend appeared to be improving by yearend 1974.

Mineral trade exerted a negative influence on Hong Kong's economy during the year, since a major part of the rise in imports was caused by higher petroleum prices. Increases also occurred in the costs of other mineral imports but were of less overall importance. Earnings from mineral exports are too small to have a significant effect on the economy.[21]

Hong Kong's mineral trade in 1972 and 1973 is given in tables 3 and 4.

[19] Far Eastern Economic Review. Hong Kong Disadvantaged. V. 88, No. 16, Apr. 18, 1975, p. 51.
[20] Subhan, Malcolm. Europe Cool to Asian Pleas. Far Eastern Economic Review, v. 88, No. 26, June 27, 1975, pp. 35–36.
[21] Hong Kong Monthly Digest of Statistics. External Trade. April 1975, pp. 14–15.

**Table 3.—Hong Kong: Exports and reexports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 440 | 1,756 | Taiwan 1,352; Philippines 404. |
| Oxide and hydroxide | 70 | 188 | Indonesia 180. |
| Metal including alloys, all forms | r 11,924 | 11,993 | Taiwan 3,824; Japan 3,342. |
| Arsenic, trioxide, pentoxide, and acids | 100 | 31 | Taiwan 25; Indonesia 4. |
| Chromium oxide and hydroxide | 18 | 17 | Indonesia 11. |
| Cobalt oxide and hydroxide | 3 | 2 | Thailand 1. |
| Copper: | | | |
| Oxide and hydroxide | 5 | 5 | Singapore 3; Malaysia 2. |
| Metal including alloys, all forms | r 8,385 | 1,164 | Taiwan 450; Republic of Korea 200; Thailand 154. |
| Gold metal, unworked or partly worked thousand troy ounces | 580 | 448 | All to Macao. |
| Iron and steel: | | | |
| Ore and concentrate thousand tons | 173 | 159 | All to Japan. |
| Scrap do | r 191 | 190 | Taiwan 84; People's Republic of China 57. |
| Pig iron, steel ingot and similar material do | -- | 4 | Indonesia 2. |
| Semimanufactures do | 41 | 34 | Indonesia 17; Singapore 5. |
| Lead: | | | |
| Oxide | 31 | 11 | All to Singapore. |
| Metal including alloys, all forms | r 2,403 | 4,193 | Taiwan 3,133. |
| Magnesium metal including alloys, all forms | -- | 113 | All to United States. |

See footnotes at end of table.

Table 3.—Hong Kong: Exports and reexports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Manganese: | | | |
| Ore | 1 | -- | |
| Oxide | 82 | 70 | Indonesia 50; People's Republic of China 15. |
| Nickel: | | | |
| Oxide and hydroxide | 8 | 7 | All to Thailand. |
| Metal including alloys, all forms | 30 | 48 | Taiwan 14; Indonesia 10; Philippines 8. |
| Silver metal including alloys thousand troy ounces | 97 | 665 | United Kingdom 438; Singapore 120. |
| Tin metal including alloys, all forms long tons | r 440 | 314 | Taiwan 153; Singapore 63; United States 40. |
| Titanium: | | | |
| Ore | 10 | NA | |
| Oxide | r 779 | 722 | Taiwan 296; Indonesia 165; Malaysia 104. |
| Tungsten, scrap | 1 | (1) | NA. |
| Zinc: | | | |
| Oxide | 95 | 192 | Indonesia 154; Thailand 21. |
| Metal including alloys, all forms | 58 | 1,392 | United States 618; Kenya 200; Thailand 199. |
| Other: | | | |
| Oxides, hydroxides and peroxides of metals, n.e.s | r 5 | 43 | Taiwan 40. |
| Metals including alloys, all forms: | | | |
| Metalloids | 1 | NA | |
| Base metals including alloys, all forms | 31 | 48 | Singapore 29; United States 14. |
| NONMETALS | | | |
| Abrasives: | | | |
| Natural, n.e.s | 58 | 35 | Singapore 14; Taiwan 11; Japan 7. |
| Grinding and polishing wheels and stones | 171 | 69 | Indonesia 23; Nigeria 20; Cambodia 10. |
| Asbestos | 7 | 1 | All to Singapore. |
| Barite and witherite | 21 | 2 | Do. |
| Chalk | 5 | 1,518 | Indonesia 749; Macao 516; Thailand 82. |
| Cement, hydraulic | r 8,398 | 14,324 | South Vietnam 7,998; Indonesia 3,999; Macao 1,481. |
| Clays and clay products, including all refractory brick: | | | |
| Crude, n.e.s | r 12,439 | 20,526 | Taiwan 19,227. |
| Products value, thousands | r $324 | NA | |
| Cryolite and chiolite | 9 | NA | |
| Diamond: | | | |
| Gem, not set or strung thousand carats | 320 | 324 | Japan 93; Israel 77; Belgium-Luxembourg 48. |
| Industrial value, thousands | r $364 | $159 | Singapore $127; Switzerland $23. |
| Diatomaceous earth | 30 | 48 | Indonesia 32; Taiwan 7. |
| Feldspar and fluorspar | 234 | 348 | Indonesia 325. |
| Fertilizer materials: | | | |
| Crude | r 412 | 215 | Singapore 56; Malaysia 56; United States 20. |
| Manufactured, all forms | 317 | 6 | Macao 3; New Zealand 2. |
| Ammonia | 2 | 2 | Malaysia 1; Macao 1. |
| Graphite, natural | 870 | 1,669 | United States 1,639. |
| Gypsum and plasters | 172 | 60 | Indonesia 50; Japan 6. |
| Lime | 308 | 147 | Macao 127. |
| Mica, all forms | r 85 | 157 | Taiwan 135; Republic of Korea 9. |
| Pigments, mineral, including processed iron oxide | r 426 | 201 | Taiwan 182. |
| Precious and semiprecious stones, including synthetic, other than diamond value, thousands | r $86,233 | $129,130 | Japan $102,209; People's Republic of China $15,043. |
| Salt and brine | r 6,284 | 88 | Malaysia 78; South Vietnam 10. |
| Sodium and potassium compounds, n.e.s | r 1,734 | 1,508 | Indonesia 783; Japan 585. |
| Stone, sand and gravel: | | | |
| Dimension stone | 999 | 1,026 | Indonesia 514; Thailand 291. |
| Gravel and crushed rocks | 30 | 6,575 | Brunei 5,135; Macao 1,355. |
| Quartz and quartzite | r 1,042 | 1,113 | Thailand 838. |

See footnotes at end of table.

Table 3.—Hong Kong: Exports and reexports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Sulfur: | | | |
| Elemental all forms | 145 | 107 | Macao 78; Republic of Korea 29. |
| Sulfuric acid | 11 | 6 | Nigeria 3; Papua New Guinea 2. |
| Talc, steatite, soapstone, pyrophyllite | r 850 | 1,109 | Indonesia 820; Philippines 138. |
| Other nonmetals, n.e.s: | | | |
| Crude | 144 | 57 | Taiwan 39; Thailand 15. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 63 | 15 | All to South Vietnam. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black and gas carbon | 22 | 86 | Indonesia 65; People's Republic of China 15. |
| Coal and coke, including briquets | 7 | 12 | Japan 11. |
| Petroleum refinery products: | | | |
| Gasoline thousand 42-gallon barrels | 38 | 42 | All to Macao. |
| Kerosine and jet fuel ----- do ---- | 70 | 30 | Macao 29. |
| Distillate fuel oil ---------- do ---- | 226 | 394 | All to Macao. |
| Residual fuel oil ---------- do ---- | 69 | 38 | Do. |
| Lubricants ---------- do ---- | 119 | 170 | Taiwan 78; Thailand 50. |
| Mineral jelly and wax ---- do ---- | 71 | 37 | Peru 13; Philippines 12. |
| Other ---------- do ---- | 13 | 18 | All to Macao. |
| Mineral tar and other coal-, petroleum- or gas-derived crude chemicals | 2 | 11 | Taiwan 8; Philippines 3. |

r Revised. NA Not available.
1 Less than ½ unit.

Table 4.—Hong Kong: Imports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrates | 505 | 905 | All from People's Republic of China. |
| Oxide and hydroxide | 314 | 535 | West Germany 201; People's Republic of China 199. |
| Metal including hydroxide | r 27,314 | 35,794 | Canada 6,209; People's Republic of China 4,636. |
| Arsenic: | | | |
| Natural sulfide | -- | 157 | People's Republic of China 107; West Germany 45. |
| Trioxide, pentoxides and acids | r 140 | 67 | People's Republic of China 62. |
| Chromium oxide and hydroxide | 64 | 35 | Japan 14; West Germany 10; United Kingdom 9. |
| Cobalt oxide | 46 | 50 | Belgium-Luxembourg 22; Australia 17; United Kingdom 11. |
| Copper: | | | |
| Copper sulfate | 65 | 75 | All from United Kingdom. |
| Oxides and hydroxides | 20,920 | 15,484 | Japan 5,058; Australia 2,068; South Vietnam 1,334. |
| Metal including alloys, all forms | 21,777 | 10,907 | All from Japan. |
| Gold: Metal, unworked and partly worked ---- thousand troy ounces | 951 | 1,167 | United Kingdom 720; Republic of South Africa 420. |
| Iron and steel: | | | |
| Scrap ---------- thousand tons | 52 | 78 | United Kingdom 31; West Germany 17. |
| Pig iron, ferroalloys and similar materials ---------- do ---- | 10 | 14 | Republic of Korea 7; People's Republic of China 5. |
| Steel, primary forms ------ do ---- | 41 | 107 | Australia 94. |
| Semimanufactures -------- do ---- | 534 | 524 | Japan 253; People's Republic of China 113. |
| Lead: | | | |
| Oxides, n.e.s | r 187 | 231 | West Germany 63; Australia 57; Netherlands 41. |
| Metal including alloys, all forms | r 4,371 | 4,356 | South Vietnam 3,694. |
| Magnesium metal including alloys, all forms | r 15 | 288 | South Vietnam 276. |
| Manganese: | | | |
| Ore and concentrate | 461 | 662 | All from Thailand. |
| Oxides | r 2,973 | 2,312 | Japan 1,015; Thailand 840; People's Republic of China 458. |
| Mercury ---------- 76-pound flasks | 668 | 698 | United Kingdom 322; People's Republic of China 164; Netherlands 120. |

See footnotes at end of table.

## Table 4.—Hong Kong: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Nickel: | | | |
| Oxides | 36 | 62 | France 26; United Kingdom 26; Netherlands 10. |
| Metal including alloys, all forms | 434 | 478 | Canada 225; United Kingdom 103. |
| Platinum-group metals including alloys, all forms thousand troy ounces | 131 | 211 | Japan 69; West Germany 58; Australia 25. |
| Rare-earth oxides | 15 | 6 | United States 3; France 2. |
| Silver metal including alloys, all forms thousand troy ounces | 168 | 400 | Philippines 176; Indonesia 97. |
| Tin metal including alloys, all forms long tons | r 939 | 768 | Malaysia 553; People's Republic of China 113. |
| Titanium: | | | |
| Ore and concentrate | 97 | 203 | All from Australia. |
| Oxides | 4,406 | 4,930 | United Kingdom 983; Australia 971; Japan 859. |
| Tungsten metal including alloys, all forms | 1 | 3 | Japan 1. |
| Zinc: | | | |
| Oxides | 958 | 1,024 | People's Republic of China 284; Australia 197; India 165. |
| Metals including alloys, all forms | r 10,725 | 17,347 | Australia 10,151. |
| Other: | | | |
| Ashes and residue containing nonferrous metal | 267 | -- | |
| Oxides, hydroxides and peroxides of metal, n.e.s | 28 | 149 | Netherlands 50; Japan 43; United Kingdom 26. |
| Metals including alloys, all forms: | | | |
| Metalloids | 11 | 8 | Japan 7. |
| Base metals including alloys, all forms | 128 | 270 | People's Republic of China 104; United Kingdom 42; Austria 40. |
| NONMETALS | | | |
| Abrasives: | | | |
| Natural, n.e.s | 475 | 1,207 | United Kingdom 476; Japan 447; United States 198. |
| Dust and powder of precious stones value | $531 | $284 | All from Belgium-Luxembourg. |
| Grinding and polishing wheels and stones | 489 | 468 | Japan 136; United Kingdom 129; West Germany 44. |
| Asbestos | 141 | 67 | People's Republic of China 43; Japan 24. |
| Barite and witherite | 214 | 157 | People's Republic of China 107; West Germany 45. |
| Boric acids | 223 | 203 | United States 180; People's Republic of China 22. |
| Cement, hydraulic thousand tons | 932 | 1,211 | People's Republic of China 639; Republic of Korea 270; Taiwan 206. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s | r 7,190 | 5,069 | United States 3,331; People's Republic of China 819; Japan 528. |
| Products value, thousands | $10,256 | $4,260 | People's Republic of China $3,742. |
| Cryolite and chiolite | 14 | 33 | Denmark 18; People's Republic of China 15. |
| Diamond: | | | |
| Gem thousand carats | 989 | 1,422 | United States 392; Israel 325; Belgium-Luxembourg 241. |
| Industrial value, thousands | $65 | $1,899 | Singapore $1,167. |
| Diatomaceous earth | 227 | 114 | United States 109. |
| Feldspar and fluorspar | 2,469 | 1,355 | All from People's Republic of China. |
| Fertilizer materials: | | | |
| Crude | 1,002 | 1,070 | People's Republic of China 565; Thailand 369. |
| Manufactured: | | | |
| Nitrogenous | 1,895 | 2,124 | Japan 2,016. |
| Phosphatic | 386 | 359 | United States 352. |
| Potassic | 13 | 16 | All from West Germany. |
| Other including mixed | 5,349 | 9,641 | West Germany 8,750. |
| Ammonia | 506 | 613 | Japan 417; People's Republic of China 137. |
| Graphite, natural | 1,046 | 1,650 | NA. |

See footnotes at end of table.

## Table 4.—Hong Kong: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Gypsum and plasters | 15,414 | 14,857 | Republic of Korea 8,848; People's Republic of China 3,074; Thailand 1,420. |
| Lime | 56,934 | 53,817 | People's Republic of China 37,715; Taiwan 6,694; North Vietnam 5,730. |
| Magnesite | 373 | 503 | All from People's Republic of China. |
| Mica, all forms | 110 | 185 | United Kingdom 94; India 60. |
| Pigments, mineral including processed iron oxides | 676 | 651 | West Germany 330; United Kingdom 76. |
| Precious and semiprecious stones, including synthetic other than diamond value, thousands | r $41,444 | $76,776 | Burma $15,508; People's Republic of China $14,069; Sri Lanka $10,867. |
| Salt | r 44,504 | 33,394 | People's Republic of China 23,419; Thailand 4,810. |
| Sodium and potassium compounds, n.e.s | r 20,197 | 20,273 | People's Republic of China 12,129; Taiwan 2,333; Japan 1,485. |
| Stone, sand and gravel: | | | |
| Dimension stone | 9,584 | 11,689 | People's Republic of China 5,945; Italy 4,869. |
| Dolomite | 254 | 51 | All from People's Republic of China. |
| Gravel and crushed rock | r 26,495 | 19,689 | Macao 14,272; People's Republic of China 5,242. |
| Limestone, except dimension | 122 | 7,762 | Japan 5,039; People's Republic of China 2,668. |
| Quartz and quartzite | r 3,172 | 1,031 | People's Republic of China 975. |
| Sand excluding metal bearing | 4,565 | 6,546 | People's Republic of China 6,345. |
| Sulfur: | | | |
| Elemental, all forms | 2,153 | 1,585 | Singapore 964; West Germany 401; Japan 170. |
| Sulfuric acid | 720 | 487 | Taiwan 295; United Kingdom 129. |
| Talc and related material | 2,265 | 2,824 | People's Republic of China 2,417. |
| Other nonmetals n.e.s.: | | | |
| Crude | r 5,529 | 5,236 | People's Republic of China 5,048. |
| Mineral waste | r 224,542 | 740 | People's Republic of China 399; Thailand 151. |
| Oxides, hydroxides and peroxides of strontium, barium and magnesium | 14 | 26 | West Germany 16; Japan 5. |
| Fluorine, bromine, iodine | 1 | 1 | All from United Kingdom. |
| Building materials of asphalt, asbestos and fiber materials and unfired nonmetals | r 16,843 | 11,784 | United Kingdom 5,025; People's Republic of China 4,828. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 384 | 56 | United States 29; Trinidad and Tobago 27. |
| Carbon black and gas carbon | 624 | 705 | Japan 333; United States 177; West Germany 73. |
| Coal, coke and peat including briquets | r 26,042 | 26,813 | North Vietnam 14,984; People's Republic of China 7,339; Japan 2,828. |
| Petroleum and refinery products: | | | |
| Gasoline, including natural thousand 42-gallon barrels | 1,009 | 1,182 | Singapore 610; Iran 304; Republic of Korea 156. |
| Kerosine, aviation, industrial and white spirits do | r 4,953 | 5,792 | Singapore 3,097. |
| Diesel and distillate fuel oil do | 6,223 | 6,638 | Singapore 3,489; Saudi Arabia 888. |
| Fuel oil do | 19,837 | 20,241 | Singapore 11,494; Saudi Arabia 5,256. |
| Lubricants do | 357 | 336 | Japan 162; United States 67; Singapore 51. |
| Mineral jelly and wax do | 106 | 98 | People's Republic of China 34; Singapore 30; Indonesia 23. |
| Other: | | | |
| Bitumen and other mixtures do | r 113 | 139 | Singapore 111; Republic of Korea 21. |
| Liquefied petroleum gas do | 685 | 516 | Singapore 177; Thailand 96; Japan 88. |
| Unspecified do | 5 | 6 | United Kingdom 2. |
| Mineral tar and other coal-, petroleum- or gas-derived crude chemicals | 286 | 241 | United Kingdom 163; Japan 73. |

r Revised.

### COMMODITY REVIEW

**Metals.**—*Iron Ore.*—The Ma On Shan mine increased its production of iron ore by 6% to 159,737 tons in 1974 from 150,713 tons in 1973, despite a continued recession in the iron and steel industry of Japan which consumes most of the mine's output.

**Nonmetals.**—*Stone, Sand, and Gravel.*—The rate of private and public construction in Hong Kong, despite a partial downturn in 1974, has begun to outstrip local supplies of mineral construction materials. Quarries in Hong Kong have been expanded, and it has been necessary to import supplies from nearby Macao. Three large granite quarries, operated by Hong Kong companies, have recently been opened on Macao to meet the requirements in Hong Kong.[22]

**Mineral Fuels.**—*Petroleum.*—Two competing proposals to build a large oil refinery in Hong Kong (from Shell Oil Co. and the combine of the Textile Alliance/TOA Oil Co., Ltd., the latter proposal including a petrochemical plant) remained under consideration by the Government during the year, but no decisions were announced. The oil shortage and subsequent recession undoubtedly were responsible for delaying these projects.[23]

## KHMER REPUBLIC [24]

Mineral production in the Khmer Republic in 1974 was probably confined to cement, gem stones, gold, phosphate rock, salt, silica sand, and simple nonmetal construction materials, although no data were officially reported.

Possible exploitable mineral occurrences of copper, iron ore, lead and zinc, manganese, and molybdenum are known; however, no attempt has been made to delineate their commercial importance, owing to the uncertain economic and political conditions that have existed in the country for the past several years.

In order to restore balance to the economy, the country's Minister of Finance, Plan, and Economy announced on September 15, 1974, a program of economic measures designed to rectify certain current severe price distortions. Three of the measures would affect mineral-related commodities and were as follows: (1) The raising of prices on petroleum refinery products to bring about reduced consumption of high dollar cost gasoline, kerosine, gas oil, diesel oil, and fuel oil; (2) the continued prohibition on the export of brass; and (3) the decontrol of the sale and transport of gold and articles made of gold throughout the country.

A new powerplant went onstream in July 1974 to relieve the electricity shortage in the capital city of Phnom Penh. The Pet Lauk Sangh powerplant, with a generating capacity of 8,400 kilowatts, will supplement the Chak Angre powerplant capacity of 10,500 kilowatts.

The oil refinery at Kompong Som has been inoperative since mid-1971, and remained so in 1974. Imports of petroleum refinery products (distillate and residual fuel oil, gasoline, jet fuel and kerosine) from Singapore and Thailand for the first half of 1974 were approximately 1.2 million barrels.

Plans were made in 1974 by the Khmer Republic to install a second offshore oil drilling rig, but further developments were not known at yearend.

## LAOS [25]

In April 1974, a Provisional Government of National Union (PGNU or RGL) was formed in Laos to solidify the country and hopefully bring about peaceful reconstruction and development measures to stabilize the country's war-torn economy. However, for both domestic and external economic reasons, efforts of the new coalition government to stabilize the economy during the year were not very successful. The budget deficit rose 42% and consumer prices advanced 47% during the year. In addition, the world economic situation in 1974 further aggravated the economic problems of

[22] World Mining. Asia Continues to Dominate in Tin and Tungsten. V. 27, No. 7, June 25, 1974, p. 111.

[23] Page 11 of work cited in footnote 13.
Hong Kong and Shanghai Banking Corporation. The Chairman's International Survey for the Year 1974. Far Eastern Economic Review, v. 88, No. 18, May 2, 1975, p. 37.

[24] Prepared by Arthur C. Meisinger, industry economist, Division of Nonmetallic Minerals.

[25] Prepared by Arthur C. Meisinger.

the country, as did the decline in foreign exchange availabilities. Despite all this, some progress was made in developing the country's small mineral resource base. Mineral production was reported for tin (the major mineral commodity), rock salt, and coal in 1974; investigations of possibly exploitable resources of potash and iron ore were initiated with foreign assistance; and gold reexports increased substantially for the second straight year.

## COMMODITY REVIEW

**Metals.**—Gold reexports from Saigon and Bangkok through Vientiane to Europe continued to respond sharply to higher price levels and profit margins. The quantity exchanged in 1974 was 1,144,810 troy ounces compared with 648,595 troy ounces in 1973.

Investigations of two iron ore deposits in Xieng Khowang Province continued with Japanese assistance in 1974.

The mining of tin from the Phon Tou and Nong Sun mines continued in 1974. Tin metal content of the ore produced was 585 tons compared with 550 long tons in 1973.

Resumption of tin mining in the Boneng District was reported, but no details were available at yearend. Also reported during the year was an interest shown by Mitsubishi Mining & Smelting Co., Ltd., Japan, in setting up a tin smelter in Laos.

**Nonmetals.**—Salt produced from brine operations near Vientiane in 1974 was reported to be 1,000 tons more than the 8,600 tons produced in 1973.

The Laotian Government initiated a drilling program to prospect for potash deposits. The project will consist of drilling five holes over a 10,000-square-kilometer (3,860 square mile) area, north-northeast of Vientiane. Intensive prospecting for potash will also be conducted across the border in Thailand.

**Mineral Fuels.**—Mining of coal was initiated by the State Express Company of Laos (Chinese-owned) from deposits north of Vientiane, near the town of Vang Vieng. The deposits were located by the Laotian Government in 1964. Reported production in 1974 was 800 tons.[26]

[26] U.S. Embassy, Vientiane. Minerals Questionnaire. State Department Airgram A-039, May 16, 1975.

**Table 5.—Laos: Exports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Iron and steel, scrap | 1,420 | 3,788 | All to Thailand. |
| Tin, ore and concentrate ---- long tons | 1,874 | 1,699 | All to Malaysia. |
| Other metallic scrap | 143 | 8 | All to Thailand. |
| NONMETALS | | | |
| Abrasives | -- | 5 | All to Japan. |
| Stone, sand and gravel | 220 | 80 | All to Thailand. |

**Table 6.—Laos: Imports of mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum metal including alloys, semimanufactures | 122 | 88 | Japan 77. |
| Arsenic sulfides | 2 | -- | |
| Copper metal including alloys | 44 | 57 | Thailand 55. |
| Iron and steel: | | | |
| Iron oxide | 1 | 6 | Mainly from Thailand. |
| Metal: | | | |
| Scrap | 303 | 394 | United States 387. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 2,827 | 1,445 | Thailand 1,422. |
| Plates and sheets | 667 | 1,008 | Japan 752; Thailand 215. |
| Wire | 690 | 550 | Thailand 520. |
| Pipes, tubes, fittings | 544 | 384 | Thailand 295; France 60. |
| Total | 4,728 | 3,387 | |

Table 6.—Laos: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Lead: | | | |
| Oxide | 100 | -- | |
| Metal including alloys | 20 | 1 | Mainly from Thailand. |
| Tin metal including alloys -- long tons | 2 | 1 | Do. |
| Zinc: | | | |
| Ore and concentrate | 2 | -- | |
| Oxide | 5 | (1) | All from United States. |
| Metal including alloys | 1 | 112 | Mainly from Japan. |
| Other nonferrous base metals, kilograms | -- | 2 | All from Hong Kong. |
| NONMETALS | | | |
| Abrasives | 1 | 1 | Mainly from South Vietnam. |
| Cement | 1,286 | 37,609 | All from Thailand. |
| Chalk | 100 | -- | |
| Clays and clay products (including nonclay bricks) | 280 | 360 | Thailand 229; Philippines 111. |
| Fertilizer materials, crude and manufactured | 168 | 825 | Mainly from Thailand. |
| Gypsum and plasters | -- | 2 | All from France. |
| Iodine, kilograms | -- | 83 | Do. |
| Lime | 57 | 27 | All from Thailand. |
| Magnesite | 44 | 35 | Thailand 30; Japan 5. |
| Mica, worked, kilograms | 125 | -- | |
| Pigments, mineral natural crude | 4 | 8 | All from Thailand. |
| Salt | 1,537 | 1,147 | Mainly from Thailand. |
| Sodium and potassium compounds | 175 | 204 | Thailand 105; Taiwan 90. |
| Stone, sand and gravel | 403 | 225 | All from Thailand. |
| Sulfur | 14 | 48 | Thailand 33; Taiwan 10. |
| Talc and steatite | 11 | 8 | Thailand 5; Republic of Korea 3. |
| Other crude nonmetals | 36 | 12 | Thailand 9; Japan 2. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Carbon black and gas carbon, kilograms | 2,000 | 620 | All from Thailand. |
| Coal, do | -- | 250 | Do. |
| Coke | 21 | -- | |
| Hydrogen and rare gases | 57 | 77 | Mainly from Thailand. |
| Petroleum: | | | |
| Crude and partly refined, 42-gallon barrels | -- | 59 | All from Thailand. |
| Refinery products: | | | |
| Gasoline, thousand 42-gallon barrels | 756 | 717 | Thailand 493; Singapore 189. |
| Kerosine, do | 194 | 208 | Thailand 197. |
| Distillate fuel oil, do | 299 | 380 | Thailand 365. |
| Residual fuel oil, do | (1) | 1 | All from Thailand. |
| Lubricants, do | 22 | 37 | Thailand 34. |
| Other: | | | |
| Liquefied petroleum gas, do | 8 | 10 | Mainly from Thailand. |
| Mineral jelly and wax, do | 11 | 3 | Indonesia 2. |
| Bitumen and bituminous mixtures, n.e.s., do | 3 | 3 | United States 2; Thailand 1. |
| Unspecified, do | (1) | (1) | Mainly from Singapore. |
| Total, do | 1,293 | 1,359 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 228 | 10 | United Kingdom 8; Thailand 2. |

[1] Less than ½ unit.

## MONGOLIA [27]

Mongolia reportedly continued to achieve progress in 1974 toward modernizing various sectors of its mining industry. Under the country's fifth 5-year plan, (1971–75) for development of the national economy, particular emphasis in 1974 was placed on increased output of ores (30%), building construction materials (10%), and electrical energy (50%). Currently, enterprises which have been built or reconstructed with Soviet aid turn out 35% of Mongolia's gross industrial output, 90% of the electrical energy, and 85% of the coal. More than 30% of Soviet economic aid received by the country during 1971–75 has been used in developing industry,

[27] Prepared by Arthur C. Meisinger.

particularly in modernizing and expanding mining enterprises.

Exploration for mineral deposits was stepped up during the year and as a result new areas of copper, tungsten, and molybdenum mineralization were discovered in the country. One of the more significant discoveries was a reportedly large deposit of phosphorite in the Hobsogol Lake Basin, northern Mongolia. According to preliminary assessments, the deposit is second in size only to the Soviet Union's Karatau phosphorite deposit.

No official Mongolian trade data are available. However, because at least 85% of the country's total trade is with the U.S.S.R., officially recorded Soviet trade statistics are believed to be highly indicative of Mongolian mineral commodity trade. Mineral commodities imported by Mongolia from the U.S.S.R. in 1974 included coal and coke, crude petroleum and petroleum products, iron and steel products, ferrous and nonferrous metals, and refractory materials. Mongolian mineral commodity exports to the U.S.S.R. included a small quantity (53 tons) of tungsten concentrates and raw material not specified, ferrous metal scrap, cement, and a significant tonnage of metallurgical grade fluorspar.

Mineral commodities produced by Mongolia in 1974 (table 1) included coal, construction materials, cement, fluorspar, tungsten, salt, and crude petroleum and petroleum refinery products.

Coal output, which accounts for about 60% of Mongolia's annual mineral production by value, continued to show improvement in 1974. During the first 4 years of the current 5-year plan (1971–75), coal output has reportedly been increased by 1.2 times, and overall production capacity of the 14 operating coal mines in 1974 was reported to be 2.42 million tons. About three-fourths of the coal mined annually is by open pit methods. Productive capacity of the Sharyn Gol surface mine was increased in 1974 from 1.4 million to 2.1 million tons, and plans to further increase coal output to 2.5 million tons in 1975 were initiated during the year.

Imported crude oil from the U.S.S.R. in 1974 continued to supply Mongolia's small refinery at Dzuun Bayan. Total imports of crude oil and petroleum products from the U.S.S.R. increased from 323,000 tons in 1973 to 347,000 tons in 1974.

In February 1973, the Governments of Mongolia and the U.S.S.R. agreed to a joint development of the large copper-molybdenum deposit discovered in 1972 in the Erdenet Mountain area of Mongolia. Development plans were continued in 1974 to include construction in 1975 of a smelter-concentrator complex and the beginning of mine development by 1976.

With the help of Soviet aid, the Berhin fluorite mine was expanded in order to double production capacity. Estimated production of fluorspar in 1974 was 240,000 tons, the same as in 1973. All of the fluorspar produced by Mongolia is shipped to the U.S.S.R., and the quantity exported in 1974 was approximately 249,000 tons compared with 239,000 tons in 1973.

## NEPAL [28]

The contribution of the mineral industries to the Nepal gross national product (GNP) was small. Government expenditures for industry and mining were estimated to have been $8.3 million in 1974.

United Nations Development Program (UNDP) technical experts arrived in Nepal to begin a $1.7 million exploration project. The Government of Nepal is contributing $800,000 of the overall cost. The project was planned to run 3 years and be staffed mainly by Nepalese technicians.

Nepal's first cement plant, scheduled to begin operation in 1974, has experienced more delay and was now expected to commence production early in 1975. The Nepal Bureau of Mines began preparation of a report on the feasibility of a second cement plant to be located in Bhainse-Hetauda which is to have a 200,000-ton per year capacity. In 1974, Nepal's requirements for cement were estimated to be 200,000 tons per year. Imports from the People's Republic of China, India, and the Republic of Korea were expected to make up the bulk of the requirements. Many construction projects in 1973–74 were delayed due to shortages of imported cement.

Limestone deposits of about 5 million tons were discovered at Bhainse-Hetauda. The Nepal Bureau of Mines expected to find additional deposits near Okhare.

[28] Prepared by Stanley K. Haines.

A two-phased feasibility study of a small-scale iron and steel plant with an estimated capacity of 50,000 to 80,000 tons per year was begun. The first phase was expected to be completed early in 1975. The capacity estimates were based on the following iron ore deposits: 10 million tons at Phulchoki and Katmandu; 8 milllion tons at Those in the Janakpur zone; 1 million tons at Labdi in the Gandaki zone; and about 1 million tons at Jirbang in the Narayani zone.

## SINGAPORE [29]

Singapore achieved a 25.1% rate of economic growth, with the GNP in 1974 reaching an estimated $5.273 billion[30] (or S$12.66 billion) in current prices. Even discounting inflation of 22%, the increase of GNP in constant dollars was 6.8% over that of 1973 as compared with 11% a year earlier. These achievements were made despite worldwide unstable monetary conditions, commodity shortages, and the oil crisis. Personal savings increased $227 million, elevating gross national savings to $1,275 million at yearend 1974. New local and foreign investments were still substantial, with manufacturing, including oil and related ventures, and shipping and services leading the way. Generally, the Singapore Government welcomes foreign investment and provides fiscal incentives and active assistance to industries of particular interest. Investment commitments in manufacturing, however, fell by 13% in 1974 to $345 million. Construction was up 36% to $400 million, or about a 16% real gain over that of 1973. Inflationary pressures eased early in 1975.

Manufacturing which encompasses mineral-related fields like petroleum refining, metal fabrication, cement, and chemicals gained ground as the leading components of the GNP. Manufacturing output, measured in terms of value added, increased to $1,267 million as compared with $957 million in 1973; there was a real gain of 2.2% despite the world recession, and this was important in sustaining high-level employment. Approximately 20% of the value added in manufacturing in 1974 was attributed to petroleum refining and nearly half of the manufactured products were exported. Most manufacturing industries were in a depressed condition, including the electronics, textiles, garments, food, leather, paper, and wood products industries.

However, the oil refining, oil rig construction, and industries related to ships were doing well to account for the overall gain. The shipbuilding and repair industry increased its turnover by 40% to $290 million, remembering that Singapore is the world's fourth largest port. Many shipyards had orders on hand for several years. Singapore supports the oil exploration activities of all of Southeast Asia, and its expanding oil rig construction industry became the third largest in the world.

Petroleum activities occupied a special role in the economy. Singapore continued to supply large quantities of fuel oil for bunkering international ships and considerable jet fuel for servicing airplanes. Overall oil imports were approximately 27 million tons valued at about S$4.90 billion ($2.04 billion) during 1974, including 23 million tons (or about 168 million barrels) of crude oil valued at S$3.93 billion ($1.63 billion). Crude oil imports in 1974 were about the same as in 1973 in tonnage, but the value increased more than 2.5 times. Only a small part of the imported petroleum was consumed internally. Five refineries were in existence, and four of these recently underwent expansion. Singapore's daily oil refining capacity was brought up to more than 1 million barrels at yearend 1974. The United States is the largest foreign investor in Singapore, and half of U.S. investments of possibly $650 million was in petroleum refining and another 15% in other areas of the oil enterprise. Singapore was very important as a support base for oil exploration and production in nearby countries, particularly Indonesia.

During the oil crisis and its aftermath, Singapore was very concerned about the economic well-being of various industrialized countries, particularly Japan and the United States because difficult times in these countries could sharply reduce their new investments in the small republic. Industries dependent upon export sales were adversely affected whereas industries supplying domestic markets fared well. Since

[29] Prepared by K. P. Wang, supervisory physical scientist, Division of Nonmetallic Minerals.

[30] Where necessary, 1974 values have been converted from Singapore dollars (S$) to U.S. dollars at the rate of S$2.46=US$1.00. In 1973, the average exchange rate was about S$2.49=US$1.00.

Singapore has a large oil refining capacity, it does not fear inadequate liquid fuel supplies for the local economy. Nevertheless, the Government, through raising oil and products taxes and urging voluntary restraint, brought down fuel consumption by 10% to 15% during 1974. Bunkering demands were generally met. Inflation was nearly brought under control around year-end 1974. While not being able to compensate for the much higher fuel rates, expanding oil exploration activities in Southeast Asia benefited Singapore greatly.

Alongside the progress in industry, trade, and tourism, Singapore also made headway towards becoming a major international financial center through development of its Asian dollar market, gold market, and secondary money market. Plans were underway to create a gold exchange, involving both spot and future contracts based upon certificates of gold deposits issued by authorized banks, on similar lines as the Winnepeg exchange.

## PRODUCTION

Singapore's output of refined petroleum products was of some importance by world standards, with residual fuel oil leading the way, followed by distillate fuel oil, gasoline, jet fuel, and kerosine, in that order. Crude oil processed in 1974 was approximately 170 million barrels, slightly higher than in 1973. In addition, significant quantities of semiprocessed oil were also refined. Ingot steel production surpassed 200,000 tons by a sizable margin. Construction continued at high levels, and this held up cement output at more than 1 million tons for the 4th year in a row. Cement imports reached approximately 1.2 million tons in 1974, with Japan and the Republic of Korea as the leading suppliers, followed by the Philippines and Thailand. Singapore produced 1.8 million cubic meters of granite in 1974. The country's mineral production statistics are shown in table 1.

## TRADE

Singapore's total foreign trade increased to $14.40 billion in 1974, as compared with $8.60 billion in 1973 when the U.S. dollar was worth slightly more. Exports (f.o.b.) increased 58.9% to $5.90 billion and imports (c.i.f.) increased 63.1% to $8.50 billion. The trade deficit was more than offset by income from services such as tourism, banking, insurance, shipping, and capital inflow from abroad. In fact, a net balance-of-payments surplus of $295 million was registered in 1974. The above figures do not include trade with Indonesia. Generally, trade with developing countries in Asia was more promising than trade with industrialized countries, because of basic activities related to building up infrastructure and new industries. Although much of the increases in both imports and exports can be attributed to much increased petroleum prices and worldwide inflation, Singapore's actual volume of cargo handled declined by only 1.5%, attaining 60.4 million freight tons. Entrepôt trade continued to represent the lifeblood of Singapore's economy.

During 1974, Singapore imported nearly 200 million barrels of oil. Approximately 84% of the imports was high-sulfur crude oil, mainly from Kuwait, Saudi Arabia, and Iran; about 13% was fuel oil; and the remainder was various other refined petroleum products. In 1973, total oil imports exceeded 220 million barrels; yet the value added up to less than one-third of the 1974 oil import value. Thus, Singapore suffered the fate of steep rises in oil prices. After Singapore refines the crude, most of the locally produced refined products plus the imported refined products are then exported or sold for bunkering. In recent years, Singapore's petroleum exports corresponded to about 75% to 80% of the petroleum imports in value. The importance of this small country as a petroleum distribution center is self-evident.

Singapore's imports of iron and steel products were worth S$556 million ($223 million) in 1973 and S$1,235 million ($515 million) in 1974. During 1974, steel exports were equivalent to about 20% of the steel imports in value and 28% in tonnage. Singapore's cement clinker imports were valued at S$80 million in 1974 and S$42 million in 1973. Imports of copper and aluminum products were somewhat lower in value than cement.

## Table 7.—Singapore: Exports of mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 400 | 320 | All to Malaysia. |
| Oxide and hydroxide | 1,503 | 1,781 | Mainly to Malaysia. |
| Metal including alloys, all forms | r 1,047 | 1,455 | Malaysia 863; Hong Kong 419. |
| Chromium oxide and hydroxide | 18 | 17 | Mainly to Malaysia. |
| Cobalt oxide and hydroxide | 1 | 1 | All to Malaysia. |
| Copper: | | | |
| Ore and concentrate | 700 | -- | |
| Metal including alloys, all forms | r 1,130 | 1,758 | Malaysia 1,229; United Kingdom 127; Hong Kong 86. |
| Gold bullion troy ounces | 2,215 | -- | |
| Iron and steel: | | | |
| Ore and concentrate | 13,761 | 10,630 | All to Malaysia. |
| Metal: | | | |
| Scrap | 4,237 | 1,070 | Malaysia 598; Republic of Korea 300; Netherlands 160. |
| Pig iron, ferroalloys, and similar materials | 346 | 3,158 | Malaysia 3,120. |
| Steel, primary forms | 2,150 | 7,122 | Malaysia 6,988. |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 21,936 | 43,526 | Malaysia 36,232; Brunei 3,006. |
| Universals, plates, sheets | r 43,018 | 68,539 | Malaysia 60,570. |
| Hoop and strip | 1,670 | 1,905 | Malaysia 1,819. |
| Rails and accessories | 2,519 | 8,802 | Malaysia 8,767. |
| Wire | 2,138 | 4,558 | Malaysia 4,143; Brunei 358. |
| Tubes, pipes, fittings | 29,274 | 22,463 | Malaysia 10,422; Brunei 6,408. |
| Castings and forgings, rough | 421 | 326 | Malaysia 202; Philippines 100. |
| Total | r 100,976 | 150,119 | |
| Lead: | | | |
| Ore and concentrate | 3 | -- | |
| Oxides | 17 | 21 | All to Malaysia. |
| Metal including alloys, all forms | 675 | 729 | Malaysia 428; Taiwan 52. |
| Manganese: | | | |
| Ore and concentrate | 1,095 | 2,320 | Malaysia 841; Philippines 375; Sri Lanka 358. |
| Oxides | 38 | 150 | Malaysia 120; Philippines 30. |
| Mercury 76-pound flasks | 104 | 592 | West Germany 348; United Kingdom 160. |
| Nickel metal including alloys, all forms | 28 | 34 | Malaysia 33. |
| Platinum-group metals and silver: | | | |
| Waste and sweepings kilograms | 2,436 | 17 | United Kingdom 13; Hong Kong 4. |
| Metals including alloys: | | | |
| Platinum group troy ounces | r 1,672 | 450 | Malaysia 386; Hong Kong 64. |
| Silver thousand troy ounces | 495 | 766 | NA. |
| Tin: | | | |
| Ore and concentrate long tons | 2,276 | 2,796 | Brazil 1,346; Mexico 1,179. |
| Metal including alloys, all forms do | r 355 | 697 | Taiwan 234; Italy 174; Japan 124. |
| Titanium: | | | |
| Ore and concentrate | 4 | 50 | All to Malaysia. |
| Oxides | 714 | 917 | Malaysia 857; Taiwan 50. |
| Tungsten ore and concentrate | 47 | 565 | North Korea 353; United Kingdom 111. |
| Zinc: | | | |
| Ore and concentrate value | r $289 | $520 | All to Malaysia. |
| Oxides and peroxide (except hydroxide) | 83 | 47 | Thailand 28; Malaysia 19. |
| Other: | | | |
| Ore and concentrate of base metals, n.e.s. (excluding iron and magnesium) | 208 | -- | |
| Ash and residue containing nonferrous metals | 430 | 2,222 | Malaysia 1,192; Taiwan 285, Japan 322. |
| Oxides, hydroxides and peroxides of metals, n.e.s | 53 | 80 | Malaysia 49; Thailand 31. |
| Metals including alloys, all forms: | | | |
| Scrap, nonferrous | 9,852 | 12,538 | Japan 7,063; Pakistan 1,290; Republic of Korea 1,205. |
| Metalloids | 4 | 21 | Malaysia 20; South Vietnam 2. |
| Alkali, alkaline earth, and rare-earth metals | 10 | 4 | All to Malaysia. |
| Base metals, including alloys, all forms, n.e.s | 176 | 206 | Japan 91; Malaysia 49; Mozambique 23. |

See footnotes at end of table.

## Table 7.—Singapore: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| **NONMETALS** | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | [1] 35 | 194 | Malaysia 191. |
| Grinding and polishing wheels and stones | 140 | 180 | Malaysia 160. |
| Asbestos | 82 | 182 | Malaysia 141. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Kaolin | 191 | 868 | Unspecified countries of Africa 500. |
| Other | 6,862 | 6,382 | Brunei 1,788; Malaysia 993; Burma 841. |
| Products: | | | |
| Refractory (including nonclay bricks) | 962 | 1,098 | Malaysia 1,081. |
| Nonrefractory | [2] r 4,326 | 5,137 | Malaysia 2,841. |
| Diamond: | | | |
| Gem, not set or strung value, thousands | $1,895 | $2,190 | United Kingdom $1,905. |
| Industrial value | $14,897 | $2,170 | Belgium-Luxembourg $1,595. |
| Feldspar and fluorspar | 2,768 | 6,439 | India 4,906. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 24 | 17 | Sri Lanka 12. |
| Phosphatic | 24,733 | 24,530 | Malaysia 23,005. |
| Manufactured: | | | |
| Nitrogenous | 83,429 | 80,260 | South Vietnam 46,349; Malaysia 18,169. |
| Phosphatic | 18,164 | 40,658 | Bangladesh 25,900; Philippines 5,000. |
| Potassic | 121,064 | 125,566 | Malaysia 114,509; Brunei 5,244. |
| Other including mixed | r 24,873 | 44,260 | Malaysia 27,600; Afghanistan 11,000. |
| Ammonia | 305 | 335 | Malaysia 303. |
| Graphite, natural | 10 | 9 | All to Malaysia. |
| Gypsum and plasters | 1,726 | 553 | Malaysia 240; South Vietnam 140. |
| Lime | 3,311 | 3,713 | Mainly to Malaysia. |
| Magnesite | 608 | -- | |
| Mica, all forms | 18 | 1,541 | Do. |
| Pigments, mineral: | | | |
| Natural, crude | r 663 | -- | |
| Iron oxides, processed | 241 | 381 | Do. |
| Precious and semiprecious stones, including synthetic, except diamond value, thousands | r $3,937 | $5,566 | Japan $2,390; Hong Kong $2,502. |
| Salt | 14,108 | 14,402 | Mainly to Malaysia. |
| Sodium and potassium compounds, n.e.s | 2,881 | 2,783 | Do. |
| Stone, sand and gravel: | | | |
| Dimension stone | 265 | 30,338 | Malaysia 20,033; San Marino 4,416. |
| Dolomite, chiefly refractory grade | 2 | 3 | All to Malaysia. |
| Gravel and crushed rock | 28,818 | 19,862 | Brunei 19,401. |
| Limestone | 561 | 254 | Malaysia 209. |
| Quartz and quartzite | 1 | 5 | All to Malaysia. |
| Sand, excluding metal bearing | 2,685 | 1,767 | Malaysia 1,150; Cambodia 411. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 12,274 | 12,912 | All to Malaysia. |
| Colloidal | 1,608 | 3,546 | South Vietnam 1,656; Hong Kong 956. |
| Sulfur dioxide | 1 | 3 | All to Malaysia. |
| Sulfuric acid | 2,657 | 1,714 | South Vietnam 1,291. |
| Talc, steatite, soapstone, pyrophyllite | 1,579 | 1,563 | Malaysia 1,360. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 16,732 | 147,790 | Malaysia 15,697; Trucial Oman 10,377. |
| Slag, dross and similar waste, not metal bearing | 11 | 20 | Malaysia 12. |
| Oxides and hydroxides of magnesium, strontium, barium | 2 | 1 | All to Malaysia. |
| Bromine, iodine, fluorine value | r $6,700 | $33,882 | South Vietnam $25,685. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s | 10,221 | 8,965 | Malaysia 7,119. |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Asphalt and bitumen, natural | 32 | 1 | All Malaysia. |
| Carbon black | 1,087 | 1,849 | Malaysia 1,147; Taiwan 680. |
| Coal, all grades, including briquets | 342 | 284 | Burma 127. |
| Coke | 1,486 | 2,270 | Malaysia 2,254. |

See footnotes at end of table.

## Table 7.—Singapore: Exports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal destinations, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Hydrogen, helium and rare gases value | r $1,544 | $671,051 | Malaysia $460,663; Brunei $88,506. |
| Petroleum: | | | |
| Crude and partly refined 42-gallon barrels | 465,155 | 129,276 | All to Japan. |
| Refinery products: [3] | | | |
| Gasoline: | | | |
| Aviation thousand 42-gallon barrels | 2,650 | 1,946 | South Vietnam 1,446. |
| Motor do | 15,454 | 17,959 | Japan 9,083; Republic of Vietnam 3,919. |
| Kerosine and jet fuel do | 26,790 | 24,065 | United States 5,665; Japan 3,703; Hong Kong 3,438. |
| Distillate fuel oil do | 22,026 | 23,945 | South Vietnam 6,772; Hong Kong 3,914; Thailand 3,059. |
| Residual fuel oil do | 48,574 | 46,993 | Japan 17,198; Hong Kong 12,147; Australia 8,152. |
| Lubricants do | 928 | 1,542 | Mainly to Malaysia. |
| Mineral jelly and wax do | 190 | 397 | Thailand 42; Taiwan 41; Philippines 40. |
| Other: | | | |
| Nonlubricating oils, n.e.s. do | r 19 | 44 | Mainly to Malaysia. |
| Pitch and petroleum coke do | 3 | 4 | Malaysia 3; Burma 1. |
| Bitumen and bituminous mixtures, n.e.s do | 1,076 | 1,283 | Australia 422; South Vietnam 252; Bangladesh 250. |
| Other do | 4,378 | 5,052 | Thailand 3,340; Hong Kong 771. |
| Total do | r 122,088 | 123,230 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons | [4] 255 | 730 | Japan 196; United States 179; Malaysia 121. |

r Revised.
[1] Excluded from this total are hand polishing stones valued at $73,313 for 1972.
[2] Excluded from this total are bricks of baked clay valued at $22,684 for 1972.
[3] In addition to the products listed, liquefied petroleum gas valued at $12,672,425 in 1972 was reported.
[4] Excluded from this total are benzol and creosote oil.

## Table 8.—Singapore: Imports of mineral commodities
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS | | | |
| Aluminum: | | | |
| Bauxite and concentrate | 1,153 | 301 | People's Republic of China 300. |
| Oxide and hydroxide | 7,451 | 9,755 | Japan 5,853; People's Republic of China 3,300. |
| Metal including alloys, all forms | 10,901 | 14,635 | Japan 3,558; United States 2,209. |
| Chromium oxide and hydroxide | 49 | 78 | West Germany 38; United Kingdom 14. |
| Cobalt oxide and hydroxide | (1) | (1) | Mainly from France and Monaco. |
| Copper: | | | |
| Ore and concentrate | 255 | -- | |
| Metal including alloys, all forms | r 7,448 | 8,749 | Australia 3,330; Japan 2,956; United States 829. |
| Gold bullion troy ounces | 26,638 | -- | |
| Iron and steel: | | | |
| Ore and concentrate | 2,952 | 50,517 | Brazil 40,640; Australia 9,685. |
| Metal: | | | |
| Scrap | 106,354 | 61,591 | Australia 39,030; United States 15,282. |
| Pig iron including cast iron | 32,470 | 31,713 | India 18,159; People's Republic of China 5,724. |
| Sponge iron, powder and shot | 252 | 186 | Japan 92; United Kingdom 29; India 25. |
| Ferroalloys: | | | |
| Ferromanganese | 1,070 | 2,900 | Japan 1,603; India 1,110. |
| Other | 453 | 3,090 | Japan 2,709. |
| Steel, primary forms | 17,390 | 39,931 | Japan 18,671; North Korea 9,690. |

See footnotes at end of table.

## Table 8.—Singapore: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| METALS—Continued | | | |
| Iron and steel—Continued | | | |
| Semimanufactures: | | | |
| Bars, rods, angles, shapes, sections | 248,380 | 341,896 | Japan 234,893; United Kingdom 29,586. |
| Universal, plates, sheets | r 340,777 | 415,371 | Japan 358,048. |
| Hoop and strip | 20,234 | 25,894 | Japan 24,593; West Germany 326. |
| Rails and accessories | 10,988 | 26,200 | United States 10,854; Netherlands 5,001. |
| Wire | 29,912 | 33,742 | People's Republic of China 14,502; Republic of Korea 12,718. |
| Tubes, pipes, fittings | 110,258 | 116,745 | Italy and San Marino 45,182; India 11,572. |
| Castings and forgings, rough | 1,395 | 2,032 | Japan 592; Italy and San Marino 513; Taiwan 318. |
| Total | r 761,944 | 961,880 | |
| Lead: | | | |
| Ore and concentrate | -- | 3 | All from France and Monaco. |
| Oxides | 270 | 558 | Australia 390; West Germany 57. |
| Manganese: | | | |
| Ore and concentrate | 200 | 16,222 | Ghana 16,220. |
| Oxides | 590 | 950 | Japan 481; India 255; People's Republic of China 122. |
| Metal, unwrought | 1,646 | 3,262 | Australia 2,267. |
| Mercury 76-pound flasks | 298 | 168 | Spain 105; United Kingdom 25; West Germany 16. |
| Nickel metal including alloys, all forms | 690 | 151 | Australia 44; United Kingdom 28; United States 24. |
| Platinum-group metal and silver: | | | |
| Waste silver and platinum troy ounces | 643 | -- | |
| Metals including alloys: | | | |
| Platinum group troy ounces | 5,433 | 1,158 | Australia 514; United Kingdom 354; Switzerland 290. |
| Silver do | r 108,316 | 467,761 | Hong Kong 96,388; Australia 82,049; United States 45,706. |
| Tin: | | | |
| Ore and concentrate long tons | 253 | 134 | Malaysia 92; Burma 34. |
| Oxides do | (1) | (1) | Mainly from United States. |
| Metal including alloys, all forms do | 731 | 1,135 | Malaysia 878; United Kingdom 78. |
| Titanium: | | | |
| Ore and concentrate: | | | |
| Ilmenite | 595 | 142 | All from Malaysia. |
| Other | -- | 301 | All from Sri Lanka. |
| Oxides | 2,692 | 3,547 | Japan 1,313; Australia 884; West Germany 737. |
| Tungsten ore and concentrate | -- | 478 | Burma 305; Thailand 173. |
| Zinc: | | | |
| Ore and concentrate | (1) | (1) | Mainly from United Kingdom. |
| Oxides and peroxides, except hydroxides | 878 | 844 | People's Republic of China 282; India 270; Malaysia 196. |
| Metal, including alloys, all forms | 7,992 | 11,878 | North Korea 5,368; Canada 4,046. |
| Zircon | 65 | 96 | Australia 71; Malaysia 15; Japan 10. |
| Other: | | | |
| Ore and concentrate of base metals, excluding iron and magnesium | 197 | 358 | Thailand 336. |
| Ash and residue containing nonferrous metals | 13,971 | -- | |
| Oxides, hydroxides and peroxides of metals, n.e.s | 185 | 218 | United Kingdom 69; Malaysia 52; Norway 34. |
| Metals, including alloys, all forms: | | | |
| Scrap, nonferrous | 16,762 | 17,876 | Malaysia 11,715; South Vietnam 4,175. |
| Metalloids | 6 | 5 | West Germany 3; People's Republic of China 1. |
| Alkali, alkaline earth, and rare-earth metals | 8 | 17 | United Kingdom 14. |
| Pyrophoric alloys | 88 | 125 | Austria 65; Switzerland 31; France and Monaco 16. |
| Base metals including alloys | r 3,785 | 1,635 | Taiwan 655; Austria 410; Japan 261. |

See footnotes at end of table.

Table 8.—Singapore: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | 71 | 163 | United States 61; Japan 26; Greece 25. |
| Dust and powder of precious and semiprecious stones value | r $4,182 | $54,161 | Australia $42,219; Japan $5,152. |
| Grinding and polishing wheels and stones | 2455 | 541 | Japan 268; United Kingdom 56; People's Republic of China 55. |
| Asbestos | 2,523 | 3,155 | Unspecified African countries 1,810; Canada 915. |
| Cement thousand tons | r 1,128 | 1,183 | Japan 379; Republic of Korea 242; Philippines 142. |
| Clays and clay products (including all refractory brick): | | | |
| Crude clays, n.e.s.: | | | |
| Kaolin | 1,568 | 3,936 | Malaysia 2,363; United Kingdom 1,263; Japan 141. |
| Other | 36,983 | 23,791 | Malaysia 4,117; United Kingdom 1,255. |
| Products: | | | |
| Refractory (including nonclay bricks) | 11,766 | 9,371 | People's Republic of China 1,915; Japan 1,641; United Kingdom 1,582. |
| Nonrefractory | 323,833 | 53,690 | Republic of Korea 13,034; Japan 8,911; Malaysia 8,754. |
| Diamond: | | | |
| Gem, not set or strung value, thousands | r $4,319 | $37,754 | India $13,324; Belgium-Luxembourg $8,627. |
| Industrial value | r $128,652 | $2,169 | Belgium-Luxembourg $1,595; Australia $281. |
| Diatomite and other infusorial earth | 364 | 422 | United States 293; Japan 106. |
| Feldspar and fluorspar | 4,418 | 6,439 | India 4,906; United Kingdom 860. |
| Fertilizer materials: | | | |
| Crude: | | | |
| Nitrogenous | 87 | 30 | All from Chile. |
| Phosphatic | 29,828 | 28,423 | Christmas Island 28,005. |
| Manufactured: | | | |
| Nitrogenous | 116,029 | 111,581 | United States 58,307; Japan 24,227; United Kingdom 14,767. |
| Phosphatic | 52,298 | 114,891 | United States 89,031; Morocco 25,000. |
| Potassic | 129,531 | 145,386 | Canada 68,154; Israel 62,381. |
| Other including mixed | 35,222 | 46,307 | West Germany 19,987; India 12,657. |
| Ammonia | 516 | 410 | Malaysia 292; Japan 65. |
| Graphite, natural | 232 | 272 | People's Republic of China 161; West Germany 84. |
| Gypsum and plasters | 38,482 | 40,773 | Australia 26,539; Japan 9,539; Thailand 3,111. |
| Lime | 3,973 | 4,192 | United States 4,148. |
| Magnesite | 695 | 3,847 | United States 3,335; Austria 460. |
| Mica, all forms | 999 | 657 | Malaysia 623. |
| Pigments, mineral: | | | |
| Natural, crude | 111 | 113 | Taiwan 30; Japan 26; India 20. |
| Iron oxides, processed | 1,009 | 1,412 | West Germany 684; People's Republic of China 482; Poland 50. |
| Precious and semiprecious stones, except diamond, worked and unworked: | | | |
| Natural value, thousands | r $2,056 | $27,750 | Hong Kong $11,785; People's Relic of China $8,480; Sri Lanka $2,733. |
| Manufactured do | $129 | $358 | India $157; Thailand $133; Hong Kong $34. |
| Salt and brine | 55,074 | 43,072 | Thailand 29,557; India 8,135; People's Republic of China 1,444. |
| Sodium and potassium compounds, n.e.s.: | | | |
| Caustic soda | 6,618 | 9,847 | West Germany 3,370; People's Republic of China 2,240. |
| Caustic potash, sodic and potassic peroxides | 348 | 556 | Belgium-Luxembourg 147; Hong Kong 107; West Germany 106. |

See footnotes at end of table.

## Table 8.—Singapore: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | 576 | 21,779 | Malaysia 19,945. |
| Worked | 3,191 | 8,550 | Italy and San Marino 3,604; People's Republic of China 2,617; Taiwan 1,186. |
| Dolomite, chiefly refractory grade | 2,598 | 3,211 | Malaysia 3,087. |
| Gravel and crushed rock | 414,446 | 502,663 | Malaysia 492,790. |
| Limestone (except dimension) | 21,846 | 32,643 | Malaysia 31,271. |
| Quartz and quartzite | 12 | 209 | All from Malaysia. |
| Sand, excluding metal bearing | 48,253 | 114,168 | Malaysia 113,118; United States 480. |
| Sulfur: | | | |
| Elemental: | | | |
| Other than colloidal | 10,370 | 5,832 | Iran 5,725. |
| Colloidal | 224 | 7,801 | Japan 7,140. |
| Sulfur dioxide | 6 | 7 | United States 4; United Kingdom 3. |
| Sulfur acid | 76 | 63 | Malaysia 30; Sweden 13; United Kingdom 8. |
| Talc, steatite, soapstone, pyrophyllite | 8,756 | 12,789 | People's Republic of China 10,280; Republic of Korea 1,140; India 410. |
| Other nonmetals, n.e.s.: | | | |
| Crude | 49,123 | 112,415 | Thailand 53,874; United States 20,631; Hong Kong 15,737. |
| Slag, dross and similar waste, not metal bearing | 17 | 368 | Malaysia 244; Switzerland 57. |
| Oxides and hydroxides of magnesium, strontium and barium | 193 | 70 | Japan 45; Netherlands 10; United Kingdom 9. |
| Bromine, iodine and fluorine value | $10,643 | $22,231 | United Kingdom $10,047; West Germany $4,939. |
| Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals n.e.s | r 9,809 | 11,791 | Malaysia 6,248; Thailand 3,456. |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | 108 | 194 | United States 84; Japan 50; Republic of Korea 50. |
| Carbon black | r 4,348 | 5,697 | Thailand 2,613; India 1,274; Australia 575. |
| Coal, all grades, including briquets | 1,068 | 1,286 | United States 1,194. |
| Coke | 4,630 | 8,473 | Japan 4,671; Taiwan 2,330. |
| Hydrogen, helium and rare gases value, thousands | r $436 | $2,441 | Japan $1,038; United States $743; Australia $386. |
| Petroleum: | | | |
| Crude and partly refined thousand 42-gallon barrels | 138,940 | 152,189 | Malaysia 58,962; Saudi Arabia 40,593; Iran 29,913. |
| Refinery products: | | | |
| Gasoline: | | | |
| Aviation ---- do | 2,337 | 2,038 | Iran 1,998. |
| Motor ---- do | 4,333 | 3,244 | Iran 1,387; Malaysia 537; Australia 514. |
| Kerosine ---- do | 2,373 | 3,034 | Malaysia 2,537; Saudi Arabia 278. |
| Jet fuel ---- do | r 7,169 | 4,079 | Malaysia 3,606. |
| Distillate fuel oil ---- do | r 6,057 | 5,950 | Bahrain 1,378; Kuwait 1,172; Malaysia 871. |
| Residual fuel oil ---- do | 26,523 | 28,191 | Saudi Arabia 8,347; Bahrain 6,978; Kuwait 4,367. |
| Lubricants ---- do | 815 | 678 | Japan 231; Netherlands 214; Malaysia 115. |
| Mineral jelly and wax do | 40 | 43 | Burma 22; People's Republic of China 15; Malaysia 4. |
| Other: [4] | | | |
| Nonlubricating oils, n.e.s do | 15 | 17 | Malaysia 6; United States 5; United Kingdom 3. |
| Pitch and petroleum coke do | 5 | 14 | United States 12; United Kingdom 2. |
| Bitumen and bituminous mixtures, n.e.s ---- do | 16 | 19 | Malaysia 9; United Kingdom 2; Republic of Korea 2. |
| Other ---- do | 517 | 1,421 | Saudi Arabia 1,249; West Germany 81. |

See footnotes at end of table.

Table 8.—Singapore: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 | Principal sources, 1973 |
|---|---|---|---|
| MINERAL FUELS AND RELATED MATERIALS—Continued | | | |
| Total ----- thousand 42-gallon barrels -- | r 50,200 | 48,728 | |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ----- | r 5329 | 449 | Malaysia 416; Thailand 14. |

r Revised.
[1] Less than ½ unit.
[2] Excluded from this total are hand polished stone valued at $122,728 for 1972.
[3] Excluded from this total are bricks of baked clay valued at $858,105 and imported in 1972 from West Malaysia.
[4] In addition to the products listed, liquefied petroleum gas valued at $40,967 in 1972 was imported.
[5] Creosote oil is excluded from this total.

## COMMODITY REVIEW

**Metals.**—*Iron and Steel.*—Singapore's steel imports were 1,429,000 tons in 1974, valued at about $515 million. This meant a 37% gain in tonnage and 131% gain in value. Steel ingot (derived from scrap) and reinforcing bar production both established records in 1974, and output of rolled semimanufactures may have topped 350,000 tons. Exports were nominal, as usual. Japan has been by far the leading supplier of steel products to Singapore, furnishing 603,000 tons in 1972, 774,000 tons in 1973, and 1,043,000 tons in 1974. About two-thirds of the steel imports from Japan consisted of shapes, plates, pipes, and tubing.

Singapore has only two steel producers of any consequence. The National Iron & Steel Mills, Ltd. (NISM), with a plant at Jurong has electric furnaces, merchant bar mills, and a wire rod mill which turn out more than 200,000 tons of steel products annually. The second and lesser producer is the Malaysia Iron & Steel Mills, Ltd. NISM and the Japanese trading firm Mitsui & Co., Ltd. are in a joint venture called the Eastern Wire Manufacturing Co.

Various ideas for building large steel plants in Singapore or nearby have been aired in recent years. Mitsui & Co. believed a steel plant producing up to 500,000 tons of plates may be economically viable and organized a Japanese steelmakers mission to visit Singapore to study the possibilities. Meanwhile, the Singapore Economic Development Board was urging a much larger integrated plant. Prime Minister Lee suggested that a multinational joint-venture, integrated steel plant might be built in Indonesia. Although Singapore's requirements are rapidly expanding, nothing specific on steel-plant construction developed in 1974, probably because of the worldwide economic difficulties.

**Nonmetals.**—*Cement.*—Singapore's three cement plants were operating at nearly full capacity in 1974. All are really grinding operations, relying totally on imports of clinker. In 1974, Singapore's imports of such clinker was 1,041,352 tons and in 1973, 1,020,721 tons. During 1972–74, the Asia Cement (Malaysia), Ltd., plant at Jurong produced about 42% of Singapore's total cement; the Singapore Cement Manufacturing Co., Ltd., plant, 32%; and the Pan Malaysia Cement Works Ltd. plant at Jurong 26%. Singapore also imported finished cement, about 145,000 tons in 1974 and 160,000 tons in 1973. Singapore's cement consumption can be estimated on the basis of these figures. Output of finished cement was 1,028,000 tons in 1973, not too different from that in 1974. Value added on Singapore's cement output was S$26.3 million in 1974 and S$22.7 million in 1973, which constitutes no real gain.

**Mineral Fuels.**—*Petroleum.*—Singapore's program to sharply expand oil refining capacity reached a pause stage at yearend 1974 after attaining the daily level of just over a million barrels throughput. Further expansion based upon exports became uncertain because of the dislocations brought about by the cessation of the Vietnam war, vastly increased oil prices, Japan's idle capacity created by prolonged recession and hence reluctance to import large quantities of refined oil from Singapore, and competition from other areas in Asia where refineries can be built. It became evident that little additional U.S. investment in Singapore's refineries would be forthcoming for the immediate years ahead even though there may be justification to build low-sulfur (i.e. to process Indonesian crude) or "sweet" oil refineries in Singa-

pore's bunkering and entrepôt trade clearly should continue to grow and local industrial demand for petroleum should also increase.

Singapore not only has the world's third largest refinery complex but is also significant in many other aspects of the oil business. Shipping is so heavy that the Singapore Parliament deliberated on a Civil Liability (Oil Pollution) Act. A floating oil storage terminal was completed around the beginning of 1974 for a consortium of five U.S. oil firms. Gardner-Denver Co. of Dallas recently convened a conference at the U.S. Trade Center in Singapore to promote the sale of oil exploration and drilling equipment. Singapore has become an oil logistics center in the Pacific, and various kinds of seafaring oil exploration and development barges and equipment are built, assembled, and serviced here.[31] Many international oil companies working in Southeast Asia have established headquarters in the small country.

Shell Eastern Petroleum Ltd., expanded its refinery on Pulau Bukum to 530,000 barrels per day near yearend 1974, making this operation the second largest refinery in the world. The Government of Singapore was still seriously considering construction of a large joint-venture petrochemical complex on Pulau Ayer Merbau off Jurong which might utilize naphtha from the Shell refinery. A 50–50 partnership with Sumitomo Chemical Co., Ltd. was thought to be firm until the Japanese company requested deferral of startup date from 1979 to 1985 on grounds of overcapacity in the Japanese home market. The latest word was that the Singapore Government was putting out feelers, to invite an Arab investment of 25% while asking for a $270 million Japanese loan.

Two wholly U.S.-owned refineries, Esso Singapore Pte. Ltd. and Mobil Oil Singapore Pte. Ltd. completed expansion programs during the year. Esso's refinery on Pulau Ayer is rated at 231,000 barrels per day and Mobil's refinery in the Jurong Industrial Estate at 175,000 barrels per day. Within the confines of Singapore Petroleum Co. Pte. Ltd.'s 65,000-barrel-per-day refinery on Pulau Merlimau (near Esso's refinery) Singapore Petroleum, in a joint venture with the Far East Oxygen (Singapore) Pte. Ltd., completed a 30-ton-per-day carbon dioxide plant (expandable to 200 tons). The fifth refinery is small and land space limitations prevent it from being expanded.

## SRI LANKA [32]

Mineral production in Sri Lanka showed mixed results for various commodities. Gem stone production decreased 13% in value from $15.8 million in 1973 to $13.8 million in 1974. Production decreases were also reported for ilmenite, mica, massive quartz, common salt, and zircon. Commodities showing increases in production were hydraulic cement, feldspar, graphite, limestone, and rutile.

The beneficial effect of the amnesty period for any illegal earnings from gem stones and the exemption from certain taxes for sales to overseas buyers and tourists continued. A side effect was a "gem rush" to open new mines and take advantage of the situation. The State Gem Corporation retail outlets do not monopolize the gem trade but acted overall to increase the quality of the offerings. Instruction and training in modern techniques to produce precision cut gem stones was begun. The primary gem stones mined are sapphires, rubies, aquamarine, and topaz.

Graphite production increased 52% from 1973 to 9,447 tons in 1974. U.S. imports of Sri Lankan graphite were 2,328 tons, down 10% from 2,578 tons in 1973. In 1974 the United States lost to Japan its traditional position as Sri Lanka's best customer for graphite.[33]

Preliminary arrangements were completed to start work on another new mine at Ragedra in the Dodangaslanda District. A pilot plant was established in collaboration with the Ceylon Institute of Scientific and Industrial Research to beneficiate lower grades of graphite. Work was well underway on a flotation plant for the upgrading of graphite. Investigations also continued to set up a plant for the manufacture of semicolloidal graphite in collaboration with the Ceylon Petroleum

[31] Far Eastern Economic Review (Hong Kong). Oil Logistics—Other Countries' Woes Are Singapore's Gain. Aug. 15, 1975, pp. 15–18.
[32] Prepared by W. Timothy Adams, physical scientist, Division of Nonmetallic Minerals.
[33] U.S. Embassy, Colombo, Sri Lanka. State Department Airgram A-43, Feb. 28, 1975.

Corporation and the Joseph Dixon Crucible Corporation. Primary markets would be in India and southeast Asia.[34]

The setting up of the State Graphite Corporation in 1972 has revitalized this industry.

The Sri Lanka Geological Survey Department completed a reserve estimate of the black sand body at Pulmoddai on the northeast coast. Exposed at near low tide is a high-grade deposit of 3.3 million tons of heavy mineral sand, 4½ miles long, 300 feet wide and 8 feet deep. Ilmenite accounts for 70% to 75% of this quantity; rutile for 10% to 12%; zircon 8% to 10%; and monazite for 0.4%. The ilmenite is under long-term contract to Japanese interests. Most of the 3,003 tons of rutile exported went to Europe. Technical difficulties at the China Bay plant were limiting the rutile and zircon output. Ilmenite production decreased from 90,551 tons in 1973 to 78,556 tons in 1974.[35]

The Sri Lanka Mineral Sands Corporation announced an expansion at the separation plant from 83,000 to 140,000 tons per year. Completion is scheduled for 1980.

The Sri Lanka Geological Department announced in 1974 the discovery of an estimated 25 million tons of recoverable phosphate rock near Eppawala in the North Central province. Production was reported to have started with an estimated 49,210 tons produced in 1974. The building of a phosphate fertilizer plant would relieve a major strain on the Sri Lanka trade balance.[36]

Sri Lanka's iron ore deposits are of two types—surface lateritic ore and banded ironstone. The lateritic deposits are located in the southwestern sector of the island and are estimated to contain 2 million to 3 million tons of easily accessible ore. Banded ironstone deposits are estimated at 5 million to 6 million tons.[37]

The petroleum industry was dependent on imports for all crude oil. Refinery input in 1974 was reported at 1,523,874 tons. Legislation was introduced in the Sri Lanka National Assembly to open doors to foreign investment. This legislation would permit foreign investment and participation in oil and gas exploration and development and expansion of the country's refining and petrochemicals industries.[38]

Ceylon Petroleum Corp. announced the expansion of its refinery at Sapugaskana to 55,300 barrels per day total capacity. The Government approved the construction of a new 100,000-barrel-per-day refinery at Trincomalee on the northeast coast.[39]

A urea fertilizer plant, using naphtha from the petroleum refinery at Sapugaskana, has been approved. The $110 million project has Kuwait and Iranian financing as well as commitments from the Asian Development Bank, West Germany, and India.[40]

McCallum Breweries (Ceylon) Ltd. has government approval to build a sodium silicate plant using local high-grade silica sand. No other details are available at this time.

## NORTH VIETNAM [41]

Economic and industrial rehabilitation continued to show progress in North Vietnam during 1974. Most of the infrastructural facilities damaged by bombing in 1972 and 1973 were reported to have started operating normally. Reliance on imports as well as foreign aid, continued to be a major item in 1974. The main economic targets for the country in 1974 were a 42% increase in industrial production and a 21% increase in the GNP compared with 1965 (prewar record year), industrial production and GNP.

Although data on total output of the country's mineral industry have not been reported in recent years, coal, iron ore, phosphate rock, zinc, tin, salt, cement, and a variety of nonmetallic construction materials were produced in 1974, according to various sources.

### COMMODITY REVIEW

**Metals.**—The Thai Nguyen Iron and Steel Works, North Vietnam's major steel plant, was reported to be fully operational. Construction of a steel rolling mill at Gia Sang was near completion with East German aid, and a steel laminating plant was reported to be about 65% constructed in Bac Thai Province.

The country's small zinc refinery at Quang Yen reportedly resumed operations

[34] Mining Journal. V. 284, No. 7284, Mar. 28, 1975, p. 229.
[35] Far Eastern Economic Review. V. 89, No. 31, Aug. 1, 1975, pp. 39–40.
[36] World Mining. V. 27, No. 7, June 25, 1974, pp. 116–117.
[37] Work cited in footnote 35.
[38] Oil and Gas Journal. V. 73, No. 7, Feb. 24, 1975, p. 38.
[39] Oil and Gas Journal. V. 73, No. 16, Apr. 21, 1975, p. 110.
[40] U.S. Embassy, Colombo, Sri Lanka. State Department Airgram A–260, Dec. 27, 1974, p. 12.
[41] Prepared by Arthur C. Meisinger.

on ore supplied by the Cho Dien mine in 1974. Tin was also produced during the year from the Cao Bang mine near the Chinese border.

Exports of large quantities of American scrap metal, mostly copper, to Hong Kong were reported in 1974. The ordinance scrap, collected from South Vietnam battle areas now under control of the North Vietnamese, was shipped from the Port of Dong Ha.

**Nonmetals.**—Work was completed on rehabilitation of 14 small cement plants located throughout the country. Expected production was 100,000 tons of cement in 1974 compared with only 23,000 tons reported for the 14 plants in 1973. Plans were made to construct seven additional plants during the year.

The quantity of cement produced from the country's largest cement plant at Haiphong was reportedly 320,000 tons in 1974.

Construction was started on the Dong Vinh cement plant in Thanh Hoa Province. Planned capacity of the plant was reported to be 10,000 tons per year.

An industrial complex, near Diem Son, for the production of construction materials was under study in 1974. The complex will reportedly include a cement plant capable of producing 1.2 million tons of cement per year.

A plant producing reinforced concrete was constructed during the year with Cuban aid. Planned output of the plant was reported to be 3,200 cubic meters of reinforced concrete slabs.

Phosphate fertilizer production was estimated to be 1.2 million tons in 1974.

New modern equipment installed in the Lam Thao superphosphate plant reportedly increased sulfuric acid production capacity by 17% in 1974. Also reported during the year was the installation of three carbonic gas furnaces and two ammonia compressors in the Ha Bac phosphate fertilizer plant, north of Hanoi.

Salt production for the first 9 months of 1974 was reported to have exceeded the 1973 output by 60,000 tons.

**Mineral Fuels.**—The country's vital coal industry was nearly back to normal. The planned norms for coal production and exports in 1974 were exceeded by 10% and 25%, respectively. Estimated output of anthracite was nearly 4.0 million tons in 1974, of which 664,410 tons was exported to Japan compared with 184,757 tons in 1973.

## SOUTH VIETNAM [42]

South Vietnam's general economy and industrial base continued to be hampered by inflation in 1974. In the last half of the year, reduced consumer demand, high costs, and continued military activity took heavy tolls on the country's industry and new investment projects. Private construction activity was at a low level throughout the year. Government projects continued but usually after being scaled down or refunded to reflect increased material costs.

The emphasis in development plans during the year was shifted further to agriculture and supporting industries. Industry in general was depressed both by lack of demand and shortage of foreign exchange for imported supplies. As an example, the Bien Hoa scrap-based steel mill could not operate at full capacity to produce round bars in 1974 because of the shortage of scrap metal. Also, higher prices for oil in 1974 sharply reduced the country's consumption of petroleum products imported to help meet domestic requirements.

Production of nonmetallic minerals in South Vietnam in 1974 included cement, various types of stone, sand and gravel (including silica sand), kaolin and other clays, lime, and gypsum. Most of the requirements for fertilizers, iron and steel products, nonferrous metals, and petroleum products continued to be imported.

### COMMODITY REVIEW

**Nonmetals.**—*Cement.*—The Ha Tien Cement Company operations were curtailed in 1974, because of adverse military interruption of supply lines to the plant facilities and shell damage to fuel tanks. The plant had to be closed down at yearend. Production of cement, therefore, was 294,000 tons compared with 265,000 tons in 1973.

*Clays—Kaolin.*—Despite numerous interruptions, kaolin was mined in Tuyen Duc Province. Production at the mine was estimated to be 265 cubic meters in 1974, all for use in the country's small porcelain

[42] Prepared by Arthur C. Meisinger.

industry. Increased kaolin production is planned for 1975 when the Vinh Tuong pottery plant is to resume operations.

*Lime and Limestone.*—Small-scale lime manufacturing continued to increase during 1974 to make up for the decrease in fertilizer imports. Sea shells were also being exploited for their lime content to supplement local fertilizer shortages in the country.

The Cam Ranh Bay area of South Vietnam is reported to have deposits of high-grade limestone estimated to contain 6 million tons. A decree establishing the Cam Ranh Bay area as an industrial zone was announced by the Prime Minister on May 21, 1974. If industrial development of the area is possible in the near future, the limestone deposits would become important in reducing the country's dependence on foreign supplies of cement.

*Salt.*—The quantity of salt produced for local consumption in 1974 was an estimated 200,000 tons, about the same as that of 1973. Construction of the Hon Khoi Salt Co.'s new purification plant was completed in October 1974. Also during the year, members of the Hon Khoi Salt Cooperative reportedly mined 17,000 tons of salt, and plans were made to double the output in 1975.

*Silica Sand.*—The KATECO Sand Company reportedly exported approximately 12,500 tons of silica sand, valued at $105,500 in 1974. Demand for the high-quality sand used in the manufacture of optical glass has been declining, according to company officials. The company reportedly does not plan to develop or expand their operations and may discontinue mining because of increasing operational costs and decreasing demand for the sand.

**Mineral Fuels.**—*Petroleum.*—South Vietnam continued to rely on imports of petroleum refinery products to meet consumption requirements in 1974. Imports, primarily from Singapore, consisted of gasoline, kerosine, jet fuel, and distillate and residual fuel oils.

In June 1974, a decree was issued by the Government that established the Petroleum and Minerals Agency (PMA) as an autonomous unit in the Ministry of Trade and Industry. The country's current National Petroleum Board (NPB) reportedly will be placed under the Directorate of Petroleum.

In the second rounding of bidding for offshore oil concessions in the South China Sea, the Government of South Vietnam granted 9 exploration rights to 11 oil companies for a total of $30 million in 1974.

Results of offshore drilling tests in August by Pecten-Vietnam, a wholly-owned subsidiary of Shell Oil Co., Inc., in partnership with Vietnam-Cities Services, Inc., confirmed a discovery of oil and natural gas. A second wildcat well drilled by the company in October also encountered oil and natural gas located in the South China Sea, approximately 344 kilometers south of Vung Tan, South Vietnam.

# The Mineral Industry of Other South Pacific Islands

By Staff, Bureau of Mines

## CONTENTS



## BRITISH SOLOMON ISLANDS [1]

Mineral activity in 1974 in the British Solomon Islands Protectorate (BSIP), if any, went unreported in available journals. Gold production (mostly from Guadalcanal) must be assumed in the light of the world gold market. Production reported for the 5 years 1969–73 follows, in troy ounces:

| Year | Quantity |
|---|---|
| 1969 | 413 |
| 1970 | 291 |
| 1971 | 444 |
| 1972 | 200 |
| 1973 | 963 |

There was no further word about the potential start of bauxite production.

[1] Prepared by Robert A. Clifton, physical scientist, Division of Nonmetallic Minerals.

Table 1.—Other Pacific Islands: Production of mineral commodities

| Area and commodity | | 1972 | 1973 | 1974 [p] |
|---|---|---|---|---|
| BRITISH SOLMON ISLANDS [1] | | | | |
| Gold | troy ounces | 200 | 963 | 873 |
| Silver | do | -- | 100 | -- |
| CHRISTMAS ISLAND [1] | | | | |
| Phosphate rock (shipments) | thousand metric tons | 935 | 1,493 | 1,809 |
| FIJI ISLANDS | | | | |
| Cement, hydraulic | metric tons | 89,293 | 91,445 | 85,348 |
| Gold, mine output, metal content | troy ounces | 81,590 | 79,983 | 68,890 |
| Lime | metric tons | 3,801 | 3,153 | -- |
| Silver, mine output, metal content | troy ounces | 23,681 | 29,530 | 27,101 |
| Stone, sand and gravel: | | | | |
| Coral sand for cement manufacture | metric tons | 100,964 | 106,814 | 124,980 |
| River sand for cement manufacture | do | NA | 60,670 | 56,056 |
| River sand and gravel | cubic meters | 282,433 | 227,190 | 570,991 |
| Coral sand and limestone | do | NA | 396 | 328 |
| Limestone | metric tons | 5,897 | NA | 3,066 |
| Other quarried stone | cubic meters | 215,782 | 218,879 | 191,831 |

See footnotes at end of table.

Table 1.—Other Pacific Islands: Production of mineral commodities—Continued

| Area and Commodity | | 1972 | 1973 | 1974 p |
|---|---|---|---|---|
| **NAURU AND OCEAN ISLAND [1]** | | | | |
| Phosphate rock, marketable (exports): | | | | |
| Nauru | thousand metric tons | 1,340 | 2,323 | 2,288 |
| Ocean Island | do | 512 | 742 | 549 |
| **NEW CALEDONIA [1]** | | | | |
| Cobalt contained in metallurgical products of nickel: | | | | |
| In ferronickel e | metric tons | 1,090 | 1,070 | 1,450 |
| In matte e | do | 140 | 150 | 130 |
| Total e | do | 1,230 | 1,220 | 1,580 |
| Jade ("Ouen Island jade") | kilograms | 1,400 | 1,280 | NA |
| Nickel: | | | | |
| Ore: | | | | |
| Gross weight | thousand metric tons | 5,512 | 5,858 | 7,015 |
| Metal content [2] | metric tons | 88,918 | 109,320 | 127,565 |
| Metallurgical products, nickel content: | | | | |
| In ferronickel | do | 36,171 | 35,759 | 48,538 |
| In matte | do | 20,059 | 21,476 | 18,837 |
| Total | do | 56,230 | 57,235 | 67,370 |
| **NEW HEBRIDES [1]** | | | | |
| Manganese: | | | | |
| Ore | do | NA | 186,006 | e 234,000 |
| Concentrate, gross weight | do | 28,247 | 30,133 | e 37,882 |
| **PAPUA NEW GUINEA [1]** | | | | |
| Copper, mine output, metal content | do | 123,959 | 153,953 | 182,868 |
| Gold, mine output, metal content | troy ounces | 409,125 | 566,216 | 453,773 |
| Silver, mine output, metal content | do | 995,443 | 1,196,383 | 985,675 |

e Estimate. p Preliminary. NA Not available.

[1] This area undoubtedly produces crude construction materials (common clays, sand, gravel, and/or stone) in addition to the listed commodities, but output is unrecorded and information is inadequate to make reliable estimates of output levels.

[2] Nickel-cobalt content of metallurgical plant products, plus estimated recoverable nickel-cobalt in exported ores.

## CHRISTMAS ISLAND [2]

Christmas Island has an area of about 55 square miles and is located in the Indian Ocean approximately 230 miles south of Java. As in past years, phosphate rock and dust was the only mineral commodity produced during 1974.

The base rock of the island is volcanic and is overlaid by corral limestone in the form of irregular pinnacles. The phosphate exists in three beds on top of the limestone, with each bed averaging 20 feet in depth. The richest A-grade bed lies immediately above the coral limestone; the lean C-grade bed, which is more like a phosphate-rich subsoil, lies on the surface; and the intermediate B-grade bed lies between the A and C beds. A calcination process has been used since 1967 to improve the low-grade C material.[3]

Exports of phosphate rock increased 21% in 1974.[4] A 25% increase in mining capacity is expected in 1975-76.[5]

[2] Prepared by Michael J. Potter, physical scientist, Division of Nonmetallic Minerals.

[3] Phosphorous and Potassium (London). Fertilizers from Christmas Island "C" Grade Phosphate. No. 74, November-December 1974, pp. 29–31, 37.

[4] Phosphorous and Potassium (London). World Trends: Phosphate Rock. No. 76, March-April 1975, p. 4.

[5] Work cited in footnote 3.

Table 2.—Christmas Island: Shipments of phosphate rock by destination
(Thousand metric tons)

| Destination | 1972 | 1973 | 1974 |
|---|---|---|---|
| Australia | 487 | 991 | 1,222 |
| Indonesia | 22 | 11 | 24 |
| Malaysia and Singapore: | | | |
| Malaysia | 109 | 150 | 145 |
| Singapore | 25 | -- | -- |
| New Zealand | 292 | 341 | 418 |
| Total | 935 | 1,493 | 1,809 |

Sources: The British Phosphate Commissioners; 1973–74: The International Superphosphate & Compound Manufacturers' Association Ltd.

## FIJI ISLANDS [6]

The value of minerals produced in Fiji increased 52% in 1974 to $9.8 million.[7] Gold was the most important mineral product, accounting for $6.8 million, or 69%, of the total mineral output value. River sand and gravel accounted for $1.7 million, and quarried stone, for another $0.7 million. All other minerals accounted for $0.6 million.

Gold production decreased 14% in 1974, but the revenues from gold increased 39%. Production was from the mine of the Emperor Gold Mining Co. Ltd., which also yielded 27,000 ounces of byproduct silver and a few thousand pounds of byproduct tellurium. The output of sand and gravel doubled in 1974, but production of quarried stone fell 12%. Production of cement decreased 7%, and production of coral sand for cement manufacture increased 17%.

A consortium headed by Amax Inc. and Anglo American Corp. of South Africa Ltd., announced the discovery of a potentially large copper deposit at Namosi, about 20 miles from Suva.[8] The consortium signed an agreement with the Government of Fiji, and planned a 3-year exploration program. Plans to drill the first exploratory oil well in Fiji were also reported. The Southern Pacific Petroleum Co. announced that it would drill the well in its concession north of the island of Vitu Levu in 1975. Altogether, about 20 companies were engaged in mineral and petroleum exploration in Fiji.

[6] Prepared by William C. Butterman, physical scientist, Division of Nonferrous Metals.
[7] Where necessary values have been converted from Fiji dollars (FD) to U.S. dollars at the rate of FDI=US$1.27.
[8] World Mining. V. 28, No. 2, February 1975, p. 82.

## Table 3.—Fiji Islands: Exports and reexports of selected mineral commodities

(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| **METALS** | | | |
| Aluminum metal including alloys: | | | |
| Scrap | | 33 | 3 |
| Unwrought and semimanufactures | value | r $428 | -- |
| Copper metal including alloys, all forms | | 186 | 171 |
| Gold, bullion | troy ounces | 81,269 | 79,606 |
| Iron and steel: | | | |
| Scrap | | 112 | 249 |
| Steel, primary forms | | 4 | 17 |
| Semimanufactures | | r 851 | 692 |
| Lead metal including alloys: | | | |
| Scrap | value | r $6,285 | $4,450 |
| Unwrought and semimanufactures | | 4 | 16 |
| Silver, bullion | troy ounces | 22,183 | 30,683 |
| Zinc metal including alloys, unwrought and semimanufactures | value | r $475 | -- |
| Other: | | | |
| Ore and concentrates | do | r $6 | $7,319 |
| Ash and residue containing nonferrous metals | | 780 | 68 |
| Metals including alloys, all forms: | | | |
| Pyrophoric alloys | value | r $904 | $500 |
| Base metals including alloys, all forms, n.e.s | do | r $1,945 | -- |
| **NONMETALS** | | | |
| Abrasives, natural, n.e.s.: | | | |
| Pumice, emery, natural corundum, etc | do | r $6 | -- |
| Grinding and polishing wheels and stones | do | r $468 | $11 |
| Cement | | 14,075 | 12,127 |
| Chalk | value | -- | $69 |
| Clays and clay products (including all refractory brick), products: | | | |
| Refractory (including nonclay bricks) | value | r $5,949 | $2,045 |
| Nonrefractory | do | r $4,474 | $8,207 |
| Diatomite and other infusorial earth | do | -- | $154 |
| Fertilizer materials: | | | |
| Crude, nitrogenous | | 3 | -- |
| Manufactured: | | | |
| Nitrogenous | | 38 | 96 |
| Phosphatic | | 27 | -- |
| Potassic | | 31 | 9,742 |
| Other including mixed | value | -- | $233 |
| Gypsum and plasters | do | r $32 | -- |
| Salt | | 1 | 3 |
| Sodium compounds, caustic soda | | 4 | 17 |
| Stone, sand and gravel: | | | |
| Crude and partly worked | value | r $243 | -- |
| Gravel and crushed rock | do | r $11 | -- |
| Sand excluding metal bearing | do | r $25 | $2,622 |
| Sulfur, sulfuric acid | do | $139 | $139 |
| Other nonmetals, n.e.s.: | | | |
| Slag, dross and similar waste, not metal bearing | | r 72 | 17 |
| Metallic oxides | value | -- | $48 |
| **MINERAL FUELS AND RELATED MATERIALS** | | | |
| Asphalt and bitumen, natural | do | r $136 | $10,378 |
| Hydrogen, nitrogen, rare gases | do | -- | $925 |
| Petroleum refinery products: | | | |
| Gasoline (including natural): | | | |
| Motor | thousand 42-gallon barrels | 64 | 47 |
| Aviation | do | 107 | 1 |
| Kerosine and jet fuel | do | 902 | 857 |
| Distillate fuel oil | do | 296 | 524 |
| Residual fuel oil | do | 18 | 191 |
| Lubricants | do | 16 | 5 |
| Other: | | | |
| White spirit | do | 5 | 6 |
| Liquefied petroleum gas | do | 1 | 1 |
| Total | do | 1,409 | 1,632 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | value | $8 | $1,058 |

r Revised.

## Table 4.—Fiji Islands: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| **METALS** | | |
| Aluminum metal including alloys: | | |
| Scrap ---- value -- | r $464 | $1,399 |
| Unwrought and semimanufactures ---- value, thousands -- | r $263 | $560 |
| Copper metal including alloys: | | |
| Matte | r (1) | 1 |
| Scrap ---- value -- | r $993 | $10,586 |
| Unwrought and semimanufactures | 110 | 281 |
| Gold metal: | | |
| Unworked or partly worked ---- troy ounces -- | 417 | 118 |
| Waste and sweepings ---- do ---- | 15 | -- |
| Iron and steel metal: | | |
| Scrap | 9 | 42 |
| Pig iron including cast iron | 280 | 123 |
| Ferroalloys and similar materials | r $63 | $2,056 |
| Steel, primary forms | 373 | 4,038 |
| Semimanufactures: | | |
| Bars, rods, angles, shapes, sections | 11,734 | 8,440 |
| Universals, plates, sheets | 7,963 | 11,462 |
| Hoop and strip | 21,439 | 25 |
| Rails and accessories ---- value, thousands -- | r $282 | $192 |
| Wire | 1,368 | 2,100 |
| Tubes, pipes, fittings | 1,055 | 1,833 |
| Castings and forgings, rough ---- value -- | r $13,809 | $4,038 |
| Lead metal including alloys: | | |
| Scrap ---- do ---- | r $1,492 | $1,433 |
| Unwrought | 74 | 2 |
| Semimanufactures ---- value, thousands -- | r $60 | $340 |
| Magnesium metal including alloys, all forms ---- value -- | r $15 | $296 |
| Nickel metal including alloys: | | |
| Scrap ---- do ---- | -- | $6 |
| Unwrought and semimanufactures ---- do ---- | r $2,890 | $753 |
| Platinum-group metals and silver including alloys: | | |
| Platinum group ---- troy ounces -- | 160 | 46 |
| Silver ---- value -- | r $5,210 | $4,764 |
| Tin metal including alloys: | | |
| Scrap ---- do ---- | r $16,694 | $1,173 |
| Unwrought and semimanufactures ---- do ---- | r $17,572 | $38,933 |
| Titanium oxides | 175 | 191 |
| Zinc metal including alloys: | | |
| Scrap ---- value -- | r $156 | $606 |
| Blue powder ---- do ---- | r $11,962 | $21,577 |
| Unwrought | 63 | 59 |
| Semimanufactures ---- value -- | r $4,623 | $10,426 |
| Other: | | |
| Oxides, hydroxides and peroxides of metals, n.e.s ---- value, thousands -- | r $56 | $102 |
| Ores and concentrates, ash and residues ---- value -- | r $5 | $38 |
| Metals including alloys, all forms, pyrophoric alloys ---- do ---- | r $5,203 | $2,248 |
| **NONMETALS** | | |
| Abrasives, natural, n.e.s.: | | |
| Pumice, emery, natural corundum, etc ---- do ---- | r $79 | $276 |
| Dust and powder of precious and semiprecious stones ---- do ---- | r $205 | -- |
| Grinding and polishing wheels and stones ---- do ---- | r $30,102 | $35,153 |
| Asbestos | (1) | 1 |
| Barite and witherite | 100 | 13 |
| Borates, crude, natural ---- value -- | -- | $4 |
| Cement | 5,662 | 759 |
| Chalk, earth colors, etc | 82 | 113 |
| Clays and clay products (including all refractory brick): | | |
| Crude clays, n.e.s | 51 | 66 |
| Products: | | |
| Refractory (including nonclay bricks) ---- value -- | r $134,708 | $43,986 |
| Nonrefractory ---- do ---- | r $260,650 | $383,961 |
| Diamond, industrial ---- do ---- | r $2,559 | $1,572 |
| Diatomite and other infusorial earth | 42 | 88 |
| Feldspar, fluorspar, etc ---- value -- | -- | $280 |
| Fertilizer materials: | | |
| Crude: | | |
| Nitrogenous | 1,370 | 52 |
| Potassic | 30 | 15 |
| Manufactured: | | |
| Nitrogenous | 32,155 | 32,393 |

**See footnotes at end of table.**

Table 4.—Fiji Islands: Imports of selected mineral commodities—Continued
(Metric tons unless otherwise specified)

| Commodity | | 1972 | 1973 |
|---|---|---|---|
| NONMETALS—Continued | | | |
| Fertilizer materials—Continued | | | |
| Manufactured—Continued | | | |
| Phosphatic | | 5,629 | 8,671 |
| Potassic | | 487 | 615 |
| Other including mixed | | 160 | 457 |
| Graphite, natural | value | r $474 | $649 |
| Gypsum and plasters | | 3,094 | 4,157 |
| Lime | | r 4 | 6 |
| Magnesite | | 7 | -- |
| Mica: | | | |
| Crude including splittings and waste | | 116 | 2 |
| Worked including agglomerated splittings | value | r $59 | $635 |
| Precious and semiprecious stones, except diamond | value, thousands | r $6,398 | $121 |
| Quartz and quartzite | value | -- | $73 |
| Salt | | r 2,134 | 2,764 |
| Sodium compounds, caustic soda | | 593 | 607 |
| Stone, sand and gravel: | | | |
| Dimension stone: | | | |
| Crude and partly worked | | (1) | 61 |
| Worked | value | r $17,912 | $11,063 |
| Gravel and crushed rock | | 3 | 2 |
| Sand excluding metal bearing | | 159 | 852 |
| Sulfur: | | | |
| Elemental, all forms | | (1) | 2 |
| Sulfuric acid, oleum | value | $25,791 | $59,904 |
| Talc, steatite, soapstone, pyrophyllite | | (1) | 1 |
| Other nonmetals, n.e.s.: | | | |
| Slag, dross and similar waste, not metal bearing | value | r $95 | $137 |
| Other | | -- | 1 |
| MINERAL FUELS AND RELATED MATERIALS | | | |
| Asphalt and bitumen, natural | | 840 | 315 |
| Coal, coke and peat | | 300 | 204 |
| Hydrogen, nitrogen, rare gases | value | r $10,451 | $10,620 |
| Petroleum: | | | |
| Crude and partly refined | thousand 42-gallon barrels | 1 | -- |
| Refinery products: | | | |
| Gasoline (including natural): | | | |
| Motor | do | 338 | 338 |
| Aviation | do | 30 | 29 |
| Kerosine | do | 162 | 139 |
| Jet fuel | do | 1,069 | 339 |
| Distillate | do | 871 | 993 |
| Residual | do | 273 | 1 |
| Lubricants | do | 26 | 32 |
| Other: | | | |
| Liquefied petroleum gas | do | 9 | 12 |
| Naphtha | do | 29 | 27 |
| Unspecified | do | 11 | 16 |
| Total | do | 2,818 | 2,426 |
| Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals | 42-gallon barrels | 112 | 950 |

r Revised.
1 Less than ½ unit.

## NAURU AND OCEAN ISLAND [9]

The Republic of Nauru is a small island with an area of 8.5 square miles; Ocean Island is even smaller than Nauru. These two islands are located near the Equator, about 1,700 miles northeast of Australia and about 160 miles from each other. Phosphate rock is the only mineral produced on both islands, and the entire output is exported.

Exports of phosphate rock from Nauru decreased about 2% in 1974. On Ocean Island, phosphate exports were down 26% compared with those of 1974.[10]

India signed a long-term agreement with the Nauru Phosphate Corp. (NPC). A shipment of 50,000 tons of rock was to be made in 1974–75, followed by larger shipments during the next 2 years. The quantities involved are less than 5% of Nauru's total capacity, but, heretofore,

[9] Prepared by Michael J. Potter.
[10] Work cited in footnote 4.

Australia, Japan, and New Zealand had been the only other markets supplied by NPC.[11]

Nauru rock is high grade, averaging 83% phosphate. By comparison, Tunisian rock is 74% phosphate and Jordanian material is 73%. Rock grading 95% is to become available in 1975, when a calcination plant goes into operation.[12]

The British Phosphate Commission, which mines phosphate on Ocean Island, decided not to expand production by 100,000 tons per year following representations from the islanders. It is estimated that deposits will be worked out by 1980 at the present rate of mining.[13]

**Table 5.—Nauru and Ocean Island: Shipments of phosphate rock by destination**
(Thousand metric tons)

| Destination | Nauru | | Ocean Island | |
|---|---|---|---|---|
| | 1973 | 1974 | 1973 | 1974 |
| Australia | 1,528 | 1,527 | 445 | 293 |
| Japan | 149 | NA | -- | -- |
| Korea, Republic of | 23 | NA | -- | -- |
| New Zealand | 612 | 368 | 297 | 256 |
| Taiwan | 11 | NA | -- | -- |
| Undistributed | -- | 393 | -- | -- |
| Total | 2,323 | 2,288 | 742 | 549 |

NA Not available.
Source: International Superphosphate & Compound Manufacturers' Association Ltd.

## NEW CALEDONIA [14]

The French island territory of New Caledonia was the second-largest producer of nickel in the market-economy countries in 1974. The principal producer of nickel on the island was Société le Nickel S.A. (SLN). Plans were announced in March 1974 to reorganize SLN into a holding company under the name "I-Metal." The quantity of nickel ore mined in 1974 totaled 7 million tons, exceeding that mined in 1973 by nearly 20%. Production of ferronickel increased 36% in 1974 compared with that of 1973, while matte production decreased 12%. Exports of nickel ore to Japan increased 19% in 1974 compared with those of 1973. The ore grade remained unchanged from 1973 at 2.46% nickel plus cobalt. At yearend, nickel producers on the island were still awaiting a decision by the French Government regarding changes in the tax laws.

### PRODUCTION

Nickel ore production increased in 1974 to 7,015,000 tons compared with 5,858,000 tons in 1973. SLN remained the principal ore producer and the only producer of refined nickel on the island. Its refinery at Doniambo produced 67,370 tons of nickel in 1974 (18,837 tons in matte and 48,533 tons in ferronickel), compared with 57,235 tons of nickel in 1973 (21,476 tons in matte and 35,759 tons in ferronickel).

A small quantity of chromium ore (3,566 tons) was mined and exported to Japan in October 1974 by the Société de la Tiebaghi. The ore contained 50% $Cr_2O_3$ and averaged 3.4% moisture. Jade was produced in limited quantities during the year.

[11] Phosphorous and Potassium (London). International Contracts and Agreements. No. 70, March–April 1974, p. 46.
[12] European Chemical News. India Secures Nauru Phosphate Rock. V. 25, No. 626, Mar. 8, 1974, p. 4.
[13] Mining Journal. Phosphate: No Increase from Ocean Island. V. 282, No. 7233, Apr. 5, 1974, p. 262.
[14] Prepared by John D. Corrick, physical scientist, Division of Ferrous Metals.

## TRADE

Mineral exports, composed principally of nickel ore, ferronickel, and nickel-cobalt matte, were valued at about $259 million in 1974, compared with $186 million in 1973. Exports of nickel ore, mainly to Japan, increased from 2,802,919 tons in 1973 to 3,347,153 tons in 1974. The average nickel content of the exported ore remained unchanged from that of 1973 at 2.46% nickel plus cobalt.

Exports of ferronickel and matte during 1974 totaled 67,196 tons of nickel content —47,123 tons in ferronickel and 20,073 tons in matte. Most of the exported ferronickel (64%) and matte (44%) went to France. Of the remaining ferronickel, the United States received 28%; Japan, 7%; and Australia, the remainder. Of the remaining matte, the United States received 26%, Japan, 17%; Canada, 8%; and Finland, 5%.

**Table 6.—New Caledonia: Exports of selected mineral commodities**
(Metric tons unless otherwise specified)

| Commodity [1] | 1972 [2] | 1973 | 1974 |
|---|---|---|---|
| Chromite, gross weight, $Cr_2O_3$ content 50.045% | -- | -- | 3,566 |
| Nickel ore, gross weight [3] thousand tons | 2,224 | 2,803 | 3,347 |
| Smelter products, nickel content: | | | |
| Ferronickel: | | | |
| Electric grade (FN4 grade, 25.1% nickel-cobalt) | 10,644 | 8,922 | 12,481 |
| Sulfur extracted grade (FN3 grade, 24.5% nickel-cobalt) | 13,645 | 7,786 | 8,620 |
| Refined grade (FN2 grade, 26.3% nickel-cobalt) | 551 | 527 | 670 |
| Overrefined grade (FN1 grade, 27.5% nickel-cobalt) | 9,581 | 7,518 | 9,896 |
| Other: | | | |
| FN5 grade, nickel-cobalt content not specified | 2,870 | 106 | 442 |
| FNC grade, nickel-cobalt content not specified | 772 | 8,499 | 15,014 |
| Nickel matte (79% nickel-cobalt) | 20,044 | 16,784 | 20,073 |

[1] In addition to the figures reported in the body of the table, data on the cobalt content of smelter products exported in 1972 was as follows in metric tons: FN4 grade—319; FN3 grade—409; FN2 grade—17; FN1 grade—287; FN5 grade—86; FNC grade—23; matte—601. Comparable data are not available for 1973 and 1974.
[2] Data series on smelter products revised to reflect nickel content only. (See footnote 1 for details on cobalt content.)
[3] Nickel-cobalt content is reported as follows in metric tons: 1972—40,892; 1973—52,085; 1974—60,645.

Source: Service de la Statistique, Annuaire Statistique de la Nouvelle Caledonie 1974–75, Noumea, 1975, pp. 104–108.

**Table 7.—New Caledonia: Imports of selected mineral commodities**
(Metric tons unless otherwise specified)

| Commodity | 1972 | 1973 |
|---|---|---|
| Cement | 119,432 | 85,598 |
| Coal | 46,880 | 102,926 |
| Coke | 79,548 | -- |
| Gypsum | 16,946 | 61,707 |
| Iron and steel: | | |
| Bars | 3,906 | 8,888 |
| Angles, shapes, sections | 6,132 | 3,067 |
| Plates and sheets | 3,453 | 4,294 |
| Petroleum refinery products: | | |
| Gasoline thousand 42-gallon barrels | 332 | 419 |
| Kerosine do | 244 | 37 |
| Distillate fuel oil do | 346 | 412 |
| Residual fuel oil do | 2,560 | 2,242 |

Source: Service de la Statistique, Annuaire Statistique de la Nouvelle Caledonie 1974–75, Noumea, 1975, p. 167.

## COMMODITY REVIEW

**Metals.**—*Chromite.*—Société de la Tiebaghi mined 3,566 tons of chromite ore and exported it to Japan in October 1974. The ore contained 50% $Cr_2O_3$ and 3.4% moisture.

*Nickel.*—Production of nickel ore in New Caledonia in 1974 was 20% greater than in 1973. Nickel smelter production increased nearly 18% in 1974 over that of 1973. Ferronickel production increased 36% and matte production decreased 12% compared with that of 1973. Exports of nickel ore to Japan in 1974 increased 19% compared with exports in 1973. Next to France, the United States was the leading recipient of ferronickel and matte, followed by (in decreasing order) Japan, Canada, Finland, and Australia.

SLN, the largest nickel producer on New Caledonia, concluded several major deals that should affect nickel production on the island for many years to come. Early in 1974, SLN sought and obtained an agreement from Kaiser Aluminum & Chemical Corp. of the U.S. to purchase Kaiser's 50% interest in the New Caledonian Nickel Co., thus giving SLN full ownership. According to company officials, the settlement would permit SLN to reinforce its position in the world nickel market, while Kaiser Aluminum could concentrate its effort on activities other than nickel.

A second major event occurred in March 1974 when the management of SLN announced an agreement in principal with Société Nationale des Petroles d'Aquitaine (SNPA) to form a joint firm to handle SLN's mining and industrial assets in New Caledonia and France. Under the proposed plan, SLN would be reorganized into a holding company under the name "I-Metal." Stockholders also approved the creation of a special nickel subsidiary, Société Métallurgique le Nickel. SNPA's agreement to take a 50% share in I-Metal's newly created subsidiary would depend on the Government's forthcoming tax proposal for New Caledonian nickel processors. Reportedly, SNPA made the first installment of 100 million francs to Société Métallurgique le Nickel. According to SNPA officials, the decision to join I-Metal would not involve any change in the company's previous decision to join Freeport Corp. in developing the Goro deposit on New Caledonia.

The third major event that occurred during 1974 was the acquisition of approximately 10% of the common stock of SLN by Amax Inc. The stock acquisition made Amax the second-largest shareholder after the approximately 26% held by the Rothchild Group. According to a company official, Amax planned to purchase material from SLN for feed to its newly renovated refinery at Port Nickel, La.

Compagnie Française d'Entreprises Minières Métallurgiques et d'Invistessements (COFREMMI), a wholly-owned subsidiary of Patino N.V., obtained a go-ahead from the French Government to establish a nickel mining and metallurgical project in northern New Caledonia. COFREMMI was to develop ore deposits in the Tiebaghi and Poum areas of New Caledonia. In the Tiebaghi deposits, proven reserves were 13 million tons of ore containing 3% nickel plus cobalt in garnierite, and 17 million tons of 1% nickel plus cobalt in laterite. Proven reserves at Poum were 35 million tons of 3.2% nickel plus cobalt in garnierite, and 41 million tons of 1.34% nickel plus cobalt in laterite. Company plans called for mining the garnierite first.

Société Métallurgique de Nickel Patino Péchiney Grânges (SOMMONI), a wholly-owned subsidiary of COFREMMI, was to build a ferronickel plant and produce 40 million pounds per year of nickel in ferronickel (35% nickel content). The output may be increased to 80 million pounds per year at a later date. Work on the plant site began in December 1973 and was to be intensified to achieve production by the middle of 1976. Société Française d'Electrometallurgie (SOFREM), a subsidiary of Péchiney Ugine Kuhlmann, was to provide technical assistance during the first 15 years of operation. SOFREM had developed and patented an electric furnace process for treating New Caledonian ores and had completed a 12-month pilot plant test. The company was to conduct an additional 6 months of trials with a 5-megawatt semicommercial plant. The semicommercial plant was to be used by SOFREM for training personnel who ultimately would operate the smelter in New Caledonia.

At yearend, the French Government still had not made a decision regarding

changes in New Caledonia's tax structure. Nevertheless, a decision regarding New Caledonian taxes was expected early in 1975.

## NEW HEBRIDES [15]

During 1974, the New Hebrides reported no activities in the mineral industry. The Forari mine on Efate (Vate) Island is assumed to have remained active and producing. In previous years, the manganese was exported as a 42% concentrate. Production and export data for the period 1964–73 are as follows, in tons of contained manganese:

| Year | Production | Exports |
|---|---|---|
| 1964 | 23,454 | 25,607 |
| 1965 | 26,229 | 31,629 |
| 1966 | 29,553 | 25,236 |
| 1967 | 27,658 | 27,948 |
| 1968 | 21,306 | 17,432 |
| 1969 | -- | -- |
| 1970 | 5,948 | 11,057 |
| 1971 | 5,811 | 5,776 |
| 1972 | 10,942 | 14,548 |
| 1973 | 12,674 | NA |

NA Not available.

## PAPUA NEW GUINEA [16]

Papua New Guinea is now self-governed, and the Papua New Guinea House of Assembly in Port Moresby set September 16, 1974, as the date for the country's full independence. A new currency, the Kina, will be introduced on April 19, 1975; its value will initially equal the currently circulated Australian dollar.

The only significant mine operation in Papua New Guinea in 1974 was the massive copper mine at Panguna on Bougainville Island. The mine, operated by Bougainville Copper Pty. Ltd. (BCP), contributed about 99.5% of the total mine output from Papua New Guinea. Of the country's $440 million export earnings in 1974, BCP accounted for $292 million. The BCP managing company is 80% owned by Bougainville Mining Ltd., with 20% held in trust by the Administration of Papua New Guinea. Bougainville Mining, in turn, is owned two thirds by Conzinc Riotinto of Australia Ltd. (CRA) and one third by New Broken Hill Consolidated Ltd.

The original contract between BCP and the Government of Papua New Guinea was renegotiated during the year. The new agreement left the equity unchanged, but provided greater tax revenue for Papua New Guinea. BCP will forfeit its tax privileges and pay a 70% excess profits tax that will start at $87.2 million after payment of standard company rate of 33-⅓%. The $87.2 million figure will guarantee the company a return of 15% on capital investment. The figure may be adjusted in the future to account for new capital investment and abnormal inflation. The agreement also revoked accelerated depreciation provisions that allowed the company to exclude 20% of its income from tax calculations. In addition, the company will be required to pay import duties, and contribute 50 cents per ton of copper produced to an environmental rehabilitation fund. The new agreement is expected to gross about $500 million over the next 10 years.

Negotiation continued between the Papua New Guinea Government and Kennecott Pacific Pty. Ltd. on the OK Tedi copper project in northwestern Papua New Guinea. At yearend, negotiations were in a critical stage, with major differences centering on taxation and arbitration. Production of minerals on the small islands of New Britain, New Ireland, Manus, Misima, and other smaller islands remained insignificant.

### PRODUCTION

The mineral production for Papua New Guinea during the last 3 years is shown in table 1.

The total value of mineral output showed an increase from the previous year. Pro-

[15] Prepared by Robert A. Clifton.
[16] Prepared by Charlie Wyche, physical scientist, Division of Nonferrous Metals.

duction of both gold and silver in 1974 was down sharply from the 1973 production. The main factor in the value increase from $275 million[17] in 1973 to $293 million in 1974 was the large rise in world metal prices. The prices that particularly affected Papua New Guinea were copper, gold, and silver.

## COMMODITY REVIEW

**Metals.**—*Copper.*—The total copper output in Papua New Guinea was produced by BCP at the Panguna mine. In 1974, a total of 30.1 million tons of ore was milled, producing 182,868 tons of copper contained in concentrates. The mine and concentrator operated satisfactorily all year. Adding a ninth ball mill and improving the crushing and grinding circuits offset the effects on production of mechanical problems. Recovery and concentrate grade improved despite a slight decline in mill-head grade.

All buyers under company sales agreements received deliveries at or above the contracted level during the first half of 1974. In the second half of the year, demand for copper declined rapidly, giving rise to surpluses of available metal. There was a particularly heavy concentration of stocks in Japan. As a result, Japanese buyers received a reduction in deliveries of concentrate from Bougainville. Sales revenue totaled $280 million in 1974 from sales of concentrates containing 192,000 tons of copper, 680,800 troy ounces of gold, and 1.5 million troy ounces of silver. In addition to long-term contracts with Japanese, West German, and Spanish firms, the People's Republic of China planned to buy 5,000 tons of copper concentrate.

The Panguna mineralization is a high-sulfur porphyry copper deposit situated in the Kawerong Valley in south-central Bougainville. Chalcopyrite is the dominant primary copper mineral, accompanied in places by bornite and a little molybdenite and silver. Gold content varies with copper, and pyrite is widely distributed. Chalcopyrite occurs principally in the Panguna Andesite, in and about the leucocratic quartz diorite, and in the biotite diorite. Oxidized and secondary zones occur at the Panguna deposit. The oxidized zone ranges from zero to 260 feet thick, and averages about 100 feet. The base of the zone may be defined mineralogically by the upper limit of chalcocite, chalcopyrite, or bornite, and the lower limit by malachite, cuprite, and limonite. An evaluation program, completed after drilling more than 200 holes in 1974 for a total of 240,000 feet, indicated reserves at approximately 870 million tons averaging 0.47% copper and 0.02 troy ounce of gold per ton.

Negotiations between Kennecott Copper Corp. and the Government of Papua New Guinea concerning development of the OK Tedi deposit continued during the year. This deposit, with proven reserves of 151 million tons assaying about 0.75% copper and 0.17 troy ounce of gold per ton is near the headwaters of the Fly River. An open pit mine to produce 30,000 tons per day of ore has been proposed. At this mining and milling rate, about 95,000 tons of copper in concentrate and 240,000 troy ounces of gold would be produced annually during the early years of operation. Kennecott submitted a detailed set of conditions to the Papua New Guinea Government under which it is prepared to develop the deposits. The firm proposed that the Government advance $70 million of the estimated $395 million cost. Japan is the anticipated market for the concentrate.

Kennecott farmed out up to 61% of its interest in another copper prospect at Yandera on the northern flank of the central Bismark Ranges, 30 miles northwest of Goroka. The Yandera interest was farmed out to Triako Mines N.L; which will share it on an equal basis with Buka Minerals N.L. Triako will manage the joint project. The 61% will be gained by spending $5 million, with the agreement covering exploration and development of about 600 square miles.

Mount Isa Mines Ltd. entered into a similar agreement with a consortium of Japanese companies comprising Sumitomo Metal Mining Co., Ltd., The Dowa Mining Co., Ltd., Sumitomo Shoji Kaisha, Ltd., and Marubeni Corporation, to farm out its Frieda River prospect in Papua New Guinea. The agreement is subject

[17] Where necessary, values have been converted from Australian dollars ($A) to U.S. dollars at the rate of $A1=US$1.43.

to approval by the Papua New Guinea Government, the Japanese Government, and other authorities. Under the agreement, Japan will spend $5 million on exploration and other work over a 5-year period to earn a 40% interest. Although further geological work is necessary, present indications are that the prospect, in the Sepik area, contains about 366 million tons of ore of an average grade of 0.45% copper.

The Australian Government pledged support of a feasibility study that could lead to establishment of a large primary aluminum smelter on the Purari River in Papua New Guinea. The Papua New Guinea-Australia-Japan study involved a series of dams on the Purari for hydroelectric power, an industrial complex that would include an aluminum smelter, and ferroalloy and caustic soda facilities. The smelter would be a 600,000-ton-per-year unit. The feed material would be supplied from Western Australia, where the Japanese are involved in bauxite-alumina projects.

**Mineral Fuels.**—*Petroleum.*—A consortium led by Phillips Australian Oil Company started drilling for oil 64 miles out from Kerema in the Gulf of Papua. Drilling will be to a depth of 17,000 feet. Australian Petroleum Co. Pty. Ltd., a subsidiary of Oil Search Ltd. of Sydney, continued to conduct exploration work in the Gulf of Papua. Shell Development (Australia) Pty. Ltd. and Australian Gulf Oil Co. were making plans to continue an exploration program in the offshore Bougainville area after evaluating data obtained earlier.